

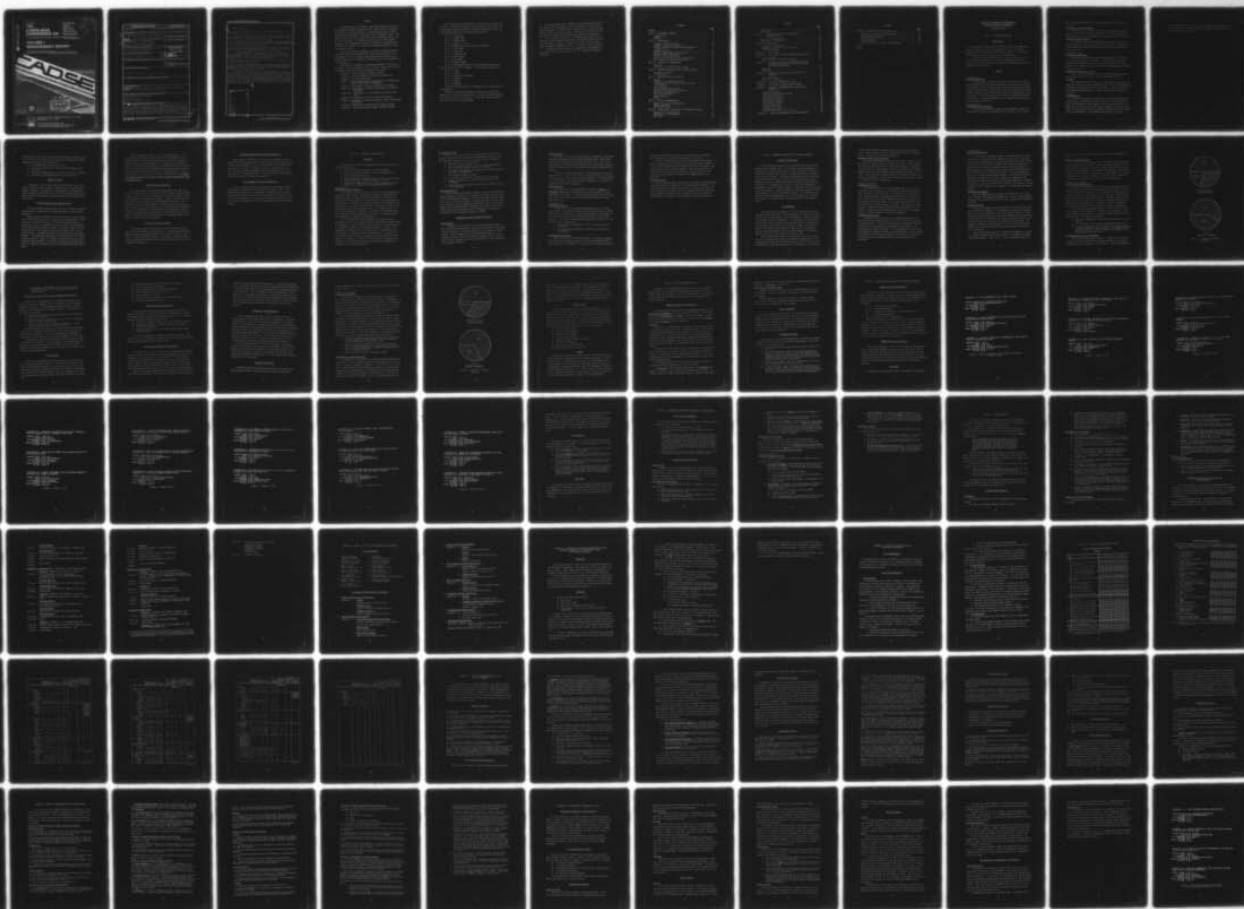
AD-A031 243

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTE--ETC F/G 9/2
CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL EN--ETC(U)
AUG 76 N RADHAKRISHNAN, J B CHEEK

UNCLASSIFIED

NL

1 of 2
ADA031243



AD A031243



CORPS-WIDE CONFERENCE ON

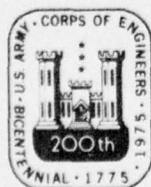
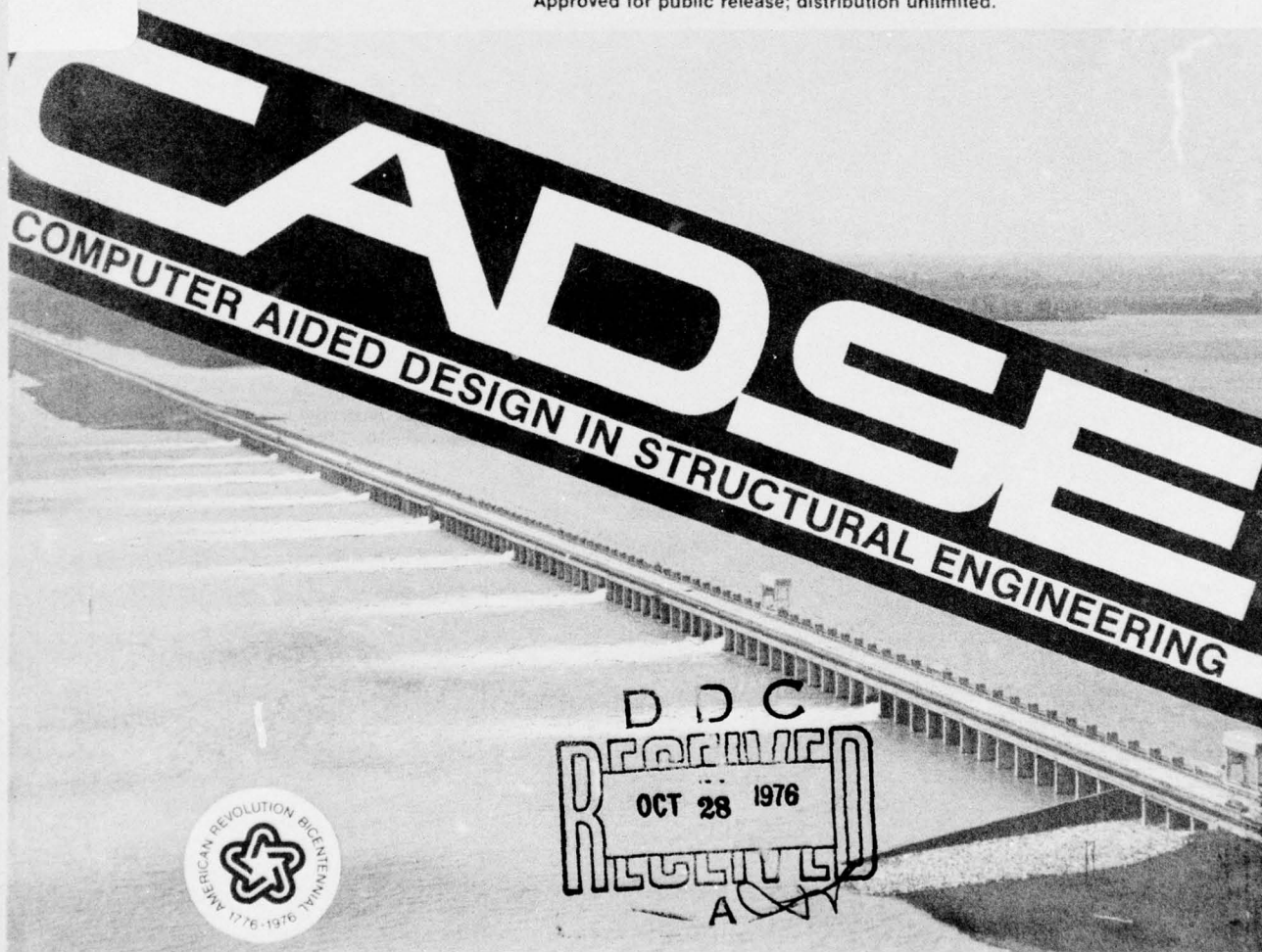
COMPUTER
AIDED
DESIGN IN
STRUCTURAL
ENGINEERING

22-26 September 1975

VOLUME I MANAGEMENT REPORT

N. RADHAKRISHNAN and JAMES B. CHEEK, JR.

Approved for public release; distribution unlimited.



August 1976

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

by Automatic Data Processing Center
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Mississippi 39180

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Unnumbered	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME I. MANAGEMENT REPORT		5. TYPE OF REPORT & PERIOD COVERED Volume 1 of 12 volumes
7. AUTHOR(s) N./Radhakrishnan, James B./Cheek, Jr/		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Waterways Experiment Station Automatic Data Processing Center P. O. Box 631, Vicksburg, MS 39180		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Office, Chief of Engineers, U. S. Army Washington, DC 20314		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 12 133p.
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE Aug 1976
		13. NUMBER OF PAGES 129
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Presented at Corps-wide Conference on Computer-Aided Design in Structural Engineering, 22-26 September 1975, New Orleans, LA.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Computer-aided design--Congresses Design--Congresses Management--Congresses Structural engineering--Congresses		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) In December 1975, the Office, Chief of Engineers, approved a proposal to develop and conduct a unique experiment in instant dissemination, a participa- tive conference. The objectives of the Conference were to produce a Corps-wide awareness of current capability in Computer-Aided Design in Structural Engineer- ing (CADSE), identify short- and long-term needs, and recommend ways to meet those needs. This Conference was one of several experiments designed to test. (Continued)		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

038100 ✓

mt

DUCK

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

20. ABSTRACT (Continued).

the value of research findings on how to enhance the dissemination of information.

The Conference was needed because the developments in CADSE have taken place so rapidly that engineers have been unable to keep up with what is generally available or to coordinate what is to be done.

The participants conducted the technical sessions and made presentations on local activity; they were selected from top and middle management and working levels in both engineering and computer fields.

Each technical session was repeated several times, thus, every person attended the sessions they wanted to attend but on a schedule set by the organizers to separate working level persons from their supervisors.

The Conference was rated highly successful by the 175 attendees from every Corps office in CONUS. It produced products such as 19 State-of-the-Corps-Art reports on various structures, 11 Division papers, seven technical papers, and the Division and moderator recommendations.

Other Conference products included a list of programs for CADSE and a survey of the attendees on views on CADSE.

The findings of the Conference are: the Corps has a few good programs; many more are needed, development should be on a Corps-wide basis; a Structural Engineering Software Center (SESC) is needed; and means for funding program development on a Corps-wide basis must be found.

The organizers analyzed the products of the Conference and recommended forming a permanent coordinating committee for Computer-Aided Structural Engineering (CASE) composed of one structural engineer from each Division Office and one middle manager engineer (rotational yearly) from a District Office within each Division and members from Corps laboratories, as appropriate. The Committee, working under the Chief, Structures Branch, OCE, is to resolve the funding and SESC findings of the Conference and then proceed to guide long-term CADSE efforts on a Corps-wide basis.

ADDITIONAL

RTIS	<input checked="" type="checkbox"/>
OPS	<input type="checkbox"/>
UNANIMOUS	<input type="checkbox"/>
JUSTIFICATION	
BY	
DISTRIBUTION/AVAILABILITY CODES	
Dist.	AVAIL. CODES

A

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

PREFACE

In December 1974, the Automatic Data Processing (ADP) Center, U. S. Army Engineer Waterways Experiment Station (WES), submitted a proposal to conduct a Corps-wide Conference on Computer-Aided Design in Structural Engineering (CADSE) to the Office, Chief of Engineers (OCE). OCE approved the proposal and efforts were started in February 1975 to conduct this Conference. The Conference was conducted in New Orleans, Louisiana, 22-26 September 1975 and was attended by 175 engineers from 48 Corps field offices, OCE, Construction Engineering Research Laboratory (CERL), and WES.

This report provides a summary of the needs for the Conference, the efforts expended in planning and conducting the Conference, the recommendations of the Division representatives and moderators on improving CADSE, and the findings and recommendations of the organizers of the Conference.

This report is intended for engineering managers in the Corps. It is Volume I of the Proceedings of the Conference. Other volumes of the Proceedings listed below will be published in due course:

- Volume II: List of Computer Programs for CADSE
- Volume III: Invited Speeches and Technical Presentations
- Volume IV: Division Presentations
- Volume V: State-of-the-Corps-Art (SOCA) Reports on Gravity Monoliths, U-Frame Locks, and Channels
- Volume VI: SOCA Reports on Gates, Stoplogs, and Trashracks
- Volume VII: SOCA Reports on Single- and Multiple-Cell Conduits and Tunnels
- Volume VIII: SOCA Reports on Pile Foundations and Sheet Pile Cells
- Volume IX: SOCA Reports on Sheet Pile Walls and T-Walls
- Volume X: SOCA Reports on Stiffness Methods, Frames, and Military Construction
- Volume XI: SOCA Reports on Earthquake and Dynamic Analyses
- Volume XII: Interactive Graphics, SEARCH and CORPS Systems

The Conference was successful due to the efforts of a multitude of people. The roles they played were different but they were all directed towards making a concept on "instant dissemination" work. The Organizing Committee for the Conference consisted of:

COL G. H. Hilt, WES
Mr. F. R. Brown, WES
Mr. D. L. Neumann, WES
Mr. J. B. Cheek, Jr., WES
Dr. N. Radhakrishnan, WES--Conference Coordinator
Mr. W. A. Price, WES
Mr. G. S. Hyde, WES
Mr. D. R. Dressler, LMVD
Mr. W. B. Dodd, LMNDE
Ms. E. Smith, LMNDE
Mr. L. H. Manson, LMNDE

An OCE Coordinating Committee also worked enthusiastically to ensure the success of the Conference. This Committee consisted of:

Mr. C. F. Corns
Mr. R. L. Delyea
Mr. R. F. Malm, OCE Coordinator
Mr. L. G. Guthrie
Mr. D. B. Baldwin
Mr. R. A. McMurrer

The New Orleans District did a remarkable job in playing hosts to the Conference.

There were 13 Division speakers, 25 moderators, two invited speakers, four technical speakers, and ten session chairmen who shared the technical load of the Conference. Also, eight computer vendors showed their ware to the participants.

The authors would like to thank all the individuals who served on the committees and the speakers and the moderators for sharing their time and thoughts. Without them the Conference would not have been the success it was. Mr. Donald Dressler, LMVD, and Mr. William Price, WES, are specially thanked for their technical guidance and assistance.

This report was written by Dr. N. Radhakrishnan, Research Civil Engineer, Computer Analysis Branch (CAB), and Special Technical Assistant, ADP Center, and Mr. J. B. Cheek, Jr., Chief, CAB, ADP Center, under the general supervision of Mr. D. L. Neumann, Chief, ADP Center.

The Director of WES during the Conference and the preparation of this report was COL G. H. Hilt, CE. Mr. F. R. Brown was Technical Director.

CONTENTS

	<u>Page</u>
PREFACE	1
PART I: A MANAGEMENT OVERVIEW	7
Organization	7
Summary	7
PART II: INTRODUCTION	10
Computers in the Corps Work	10
Problems in Effective Computer Use	10
Computer Programs for Engineering, Management's Concerns	11
Summary of Needs	12
Efforts Toward Meeting Long-Term Goals	12
Immediate Needs, Unserved	13
How Not to Solve the Problem	13
Positive Solutions Via "Instant Dissemination"	14
Past Attempts at Instant Dissemination	14
PART III: RESEARCH IN DISSEMINATION	15
Objective	15
Guidelines for the Conference, Planning	16
PART IV: CONFERENCE PLANNING AND THE GENERAL SESSIONS	19
Conference Preparation	19
The Conference	19
PART V: CONFERENCE SPECIALITY SESSIONS	25
Concept	25
Features of the Speciality Sessions	25
Preplanning for the Sessions, Structures-Type Questionnaire	26
Session Topics	26
Learning/Demonstration Session	27
Selecting and Preparing the Moderators	27
Moderators Planning Meeting	28
During the Conference	28
Vendor Displays	31
Summary	31
PART VI: DIVISION RECOMMENDATIONS	32
Summary of Division Recommendations	32
Future Conferences	33
Miscellaneous Items	33
PART VII: PARTICIPANTS' EVALUATION OF COMPUTER-AIDED DESIGN	34
Responses to the Questionnaire	34
Significance of the Responses	34
Bar Graphs	34

CONTENTS

	<u>Page</u>
Interpretation	45
Other Data	45
PART VIII: CONFERENCE FINDINGS AND APPROACHES TO MEETING NEEDS	46
Areas of General Agreement	46
Approaches to Meeting Needs	46
PART IX: RECOMMENDATIONS	49
Corps-Wide CASE Committee	49
Fundamental Obstacles to be Overcome by the CASE Committee	51
APPENDIX A: CADSE AGENDA	A1
APPENDIX B: CADSE, LIST OF DIVISION SPEAKERS AND MODERATORS . .	B1
Division Speakers	B1
Speciality Session Topics and Moderators	B1
APPENDIX C: GUIDELINES FOR DIVISION PRESENTATIONS AT THE SEPTEMBER CONFERENCE ON COMPUTER-AIDED DESIGN FOR STRUCTURAL ENGINEERS	C1
Background	C1
Guidelines	C1
APPENDIX D: SPECIALITY SESSIONS ROLE AND FUNCTIONS OF MODERATORS	D1
Role of Moderators	D1
Functions of Moderator	D1
APPENDIX E: CORPS-WIDE CONFERENCE ON CADSE	E1
APPENDIX F: STRUCTURES-TYPE QUESTIONNAIRE SUMMARY	F1
APPENDIX G: TENTATIVE RECOMMENDATIONS OF THE DIVISION SPEAKERS	G1
Huntsville Division	G1
Lower Mississippi Valley Division	G1
Missouri River Division	G4
New England Division	G4
North Atlantic Division	G6
North Central Division	G6
North Pacific Division	G6
Ohio River Division	G7
South Atlantic Division	G7
Southwestern Division	G8
From the Supervisor's Point of View	G9
APPENDIX H: TENTATIVE RECOMMENDATIONS OF THE MODERATORS	H1

CONTENTS

	<u>Page</u>
APPENDIX I: PARTICIPANTS' EVALUATION OF CADSE	I1
Summaries of Responses to Questionnaires	I1
The Questionnaire, Format	I1
Participants' Responses	I1
Overall Summary	I2
Detailed Summary	I4
The Evaluation in Retrospect, A Post Mortem	I5

FIGURE I1

TABLE I1

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED
DESIGN IN STRUCTURAL ENGINEERING

MANAGEMENT REPORT

PART I: A MANAGEMENT OVERVIEW

Organization

This report is divided into nine parts so that busy readers may quickly locate the material most meaningful to them. The readers desiring detailed information supporting the statements and conclusions drawn in each part will find it in the nine appendixes.

In order to help the reader of one or two parts place the information in proper perspective, the following summary is provided. It sets out in concise form the most significant statements and conclusions brought out in this report.

Summary

An experiment in
instant dissemination

In December 1974, OCE approved a proposal to develop and conduct a unique experiment in instant dissemination, a participative conference. The objectives of this Conference were to produce a Corps-wide awareness of current capability in Computer-Aided Design in Structural Engineering (CADSE), identify short- and long-term needs, and recommend ways to meet those needs. This Conference was one of several experiments designed to test the value of research findings on how to enhance the dissemination of information (see Part II).

Pressing need for
information and coordination

The Conference was needed because the developments in CADSE have taken place so rapidly that engineers have been unable to keep up with

what is generally available or to coordinate what is to be done (see Part III).

Participants run the Conference

The participants conducted the technical sessions, made presentations on local activity, were selected from top and middle management and working levels in both engineering and computer fields (see Part IV).

Repeated technical sessions

Each technical session was repeated several times. Thus, every person attended the sessions they wanted to attend but on a schedule set by the organizers to separate working level persons from their supervisors (see Part V).

A successful Conference and its products

The Conference was rated highly successful by the 175 attendees from every Corps office in the CONUS. It produced products such as 19 State-of-the-Corps-Art reports on various structures, 11 division papers, seven technical papers, and the Division and moderator recommendations (see Part VI).

Program list and survey of views

Other Conference products include a list of programs for CADSE and a survey of the attendees on views on CADSE (see Part VII).

Findings

The findings of the Conference are: The Corps has a few good programs; many more are needed; development should be on a Corps-wide basis; a Structural Engineering Software Center (SESC) is needed; and means for funding program development on a Corps-wide basis must be found (see Part VIII).

Recommendations

The organizers analyzed the products of the Conference and recommended forming a permanent coordinating committee for Computer-Aided Structural Engineering (CASE) composed of one structural engineer from each Division office and one middle manager engineer (rotational yearly) from a District Office with each Division and members from Corps laboratories, as appropriate. The Committee, working under the Chief,

Structures Branch, OCE, is to resolve the funding and SESC findings of the Conference and then proceed to guide long-term CADSE efforts on a Corps-wide basis (see Part IX).

PART II: INTRODUCTION

Computers in the Corps Work

"The magnitude and complexity of the engineering being done in the Corps today could not be accomplished without computers."

Making such a statement 15 yr ago would have, at best, produced a few smiles and snickers. Today that statement brings nods of approval from many of the Corps engineers. The Corps has many examples to show that computers can do complex work. Intelligently used, computers can free engineers from the tedium of routine tasks. They can free engineers to do the things engineers do best, such as the decision making inherent in the creative process of engineering.

Unfortunately, the Corps also has examples which show that the computer can waste time, produce incorrect results, and, in the process, substitute a new kind of tedium. In this new tedium the engineer-computer user becomes a slave to a poorly designed computer program on an unresponsive computer system. Thus, today the computer shows great promise in many areas and vexing problems in some others.

Problems in Effective Computer Use

The problems are concentrated in four areas:

- a. Providing adequate computer power (hardware).
- b. Developing good engineering computer programs (software).
- c. Teaching people how to use the computer (training).
- d. Keeping everyone aware of Corps-wide developments (dissemination).

The Corps is taking steps to resolve those problems.

Hardware problems

The Corps has recognized the need of computers to support its engineers. Accordingly, they have provided computer power at the District and Division Offices and several R&D laboratories. That equipment served to develop a broad user base in both engineering and business

applications. It has generally proved inadequate to serve both needs.

Software problems

Developing good software requires a lot of time, money, knowledge, skill, and long-term dedication to the effort. Progress in software development has been slowed by:

- a. Some engineers lacking background experience in the use of computers.
- b. Lack of awareness of computer techniques on some supervisors' parts makes them reluctant to permit design engineers to develop programs or use computers.
- c. Pressing time constraints on jobs prevent development of new programs for the computer solution of the problem.
- d. Shortage of experienced engineering application programmers.
- e. Funds for program development frequently come from a single project, thus there is little emphasis on developing the program to meet Corps-wide needs. Also, documentation tends to be inadequate for general use.

Training problems

Training the would-be computer user is expensive and takes a long time. Problems center on the facts that:

- a. It cannot be learned in a day. It takes years of full-time work to develop a good engineering computer programmer.
- b. It takes practice to learn to use a program effectively. This means the engineer must have time, money, and management support to permit him to use the computer and become familiar with the features and limitations of the programs he plans to use.

Dissemination problems

The lack of effective means for letting engineers know what is available and what is being developed has resulted in higher than necessary engineering costs. Those high costs were due, in part, to duplication of program development work or not using an existing program through ignorance of its existence.

Computer Programs for Engineering, Management's Concerns

The reasons mentioned in the preceding paragraphs have not

prevented the Corps structural engineers from developing excellent computer programs to aid them in their design and analysis work. However, management continues to be concerned that:

- a. The programs must produce valid results.
- b. The cost and time needed to develop those programs must be kept low.
- c. Program development must not interfere with project deadlines.
- d. Duplication of programming efforts must be avoided.

Summary of Needs

To summarize, the principal needs for the effective use of computers in Corps work are training of engineers and their management in computer techniques, development of a good library of computer-aided design programs, avoiding duplication of efforts in developing new programs, and providing adequate hardware resources for both engineering and business.

Efforts Toward Meeting Long-Term Goals

The Corps has taken steps to make sure that its engineer-computer users overcome or bypass the difficulties mentioned in the preceding paragraphs.

Training needs of engineers are met by a series of courses taught by the Corps laboratories, most of them under OCE sponsorship. For instance, the Structures Division, Civil Works Directorate (CWD), is sponsoring a series of programmed courses this year to train engineers in the "Earthquake and Dynamic Analyses of Structures" and the "Finite Element Method." The Computation and Analysis Branch, CWD, is sponsoring courses on "Computer Applications for Engineers and Engineering Managers." The Engineering Information and Data Systems Office (EIDSO) periodically sponsors courses on "Computer Utilization" specially geared for engineering executives. The EIDSO is developing long-range plans to replace or upgrade the hardware to meet future engineering and business needs.

Other long-term activities, such as the establishment of the Scientific and Engineering Branch of the EIDSO; the formation of the Engineer Computer Concepts and Application Group (ECCAG) to advise on computer matters, the establishment of the Computation and Analysis Branch in the CWD, and the funding of the Conversationally Oriented Real-Time Program Generating System (CORPS) time-sharing library and the Engineer Computer Program Library (ECPL), all represent moves to reach long-term goals. The objective of these combined efforts is to produce a Corps-wide library of the highest quality computer programs for design and analysis work.

Immediate Needs, Unserved

The Corps is making significant progress toward that objective. Yet, while improvements are taking place, the engineer who uses or wants to use the computer has little knowledge of Corps-wide activity in computer aided design in engineering (CAD-E). Further, "pockets" of activity in CAD-E have developed in offices throughout the Corps. Those pockets have produced major advances in CAD-E, yet they are often unaware of parallel or (unfortunately) duplicate work being done elsewhere. Thus, while training and the establishment of a computer-aided design library of programs are the ultimate but long-term solutions to the problems, short-term needs such as dissemination of computer program information to engineers must be addressed.

How Not to Solve the Problem

The current situation indicates that short-term needs in CAD-E must be met while pursuing long-term goals. In meeting those short-term needs, we must avoid highly restrictive, rule-oriented solutions that stifle or inhibit further development. This rules out solutions such as stop all programming, program only after getting OCE approval, use only "standard" programs, etc.

Positive Solutions Via "Instant Dissemination"

More productive solutions for short-term needs involve finding ways to tell Corps engineers what everyone else is doing in CAD-E. This solution takes advantage of the fact that engineers like to make progress; they do not like to "reinvent the wheel." Consequently, they will turn their program development talents to unserved areas, once they know what is already available. From those facts and requirements evolved the concept of "instant dissemination."

Past Attempts at Instant Dissemination

While the need for instant dissemination is well substantiated and agreed upon, the means by which one seeks to achieve it vary in both approach and effectiveness. Conferences, telephone calls, briefings, reports, newsletters, etc., have all been used with some success. However, the fact remains that they have not produced a significant Corps-wide increase in awareness of activity and capability in computer-aided design.

PART III: RESEARCH IN DISSEMINATION

Objective

The objective of the effort summarized in this report was to develop a technique that:

- a. Yielded the greatest exchange of useful information.
- b. Did so in the least possible time for a reasonable cost.
- c. Produced immediate products.
- d. Produced permanent, on-going channels of direct communication among working level engineers throughout the Corps.
- e. Improved the communication between upper management and the working level engineer regarding computer-aided design.

Selecting the information-transfer vehicle

The previously outlined objectives set forth the requirements, but they do not point the way. The computer newsletter, Engineering Computer Notes (ECN), is one such effort that appears to be successful. Another approach that seems to hold great promise for meeting those requirements is a conference. Yet, past conferences have fallen short of their potential. To get full benefit from a conference, one must first identify the reasons why conferences fail. Then a format must be devised to overcome those limitations. It was from that standpoint and with the aforementioned objectives in view that the organizers began this experiment in information dissemination.

In 1974, funded under project Improved Data Effectiveness and Availability (IDEA), by the Army through the Army Materiel Command (AMC), the researchers at the WES Computer Center started to propose new ways to transfer information and develop experiments to test them. This Conference, the outgrowth of that activity, was an experiment to test the validity of conclusions on why conferences fail. It served as a test bed for ideas which seek to improve the information-transfer efficiency of conferences. In order to place the total Conference in perspective, it is important to present the research that preceded its proposal to OCE as a needed activity.

Why conferences fail

Failure in this context means that significant improvements in instant dissemination and continued cross-communication did not result. The researchers isolated the following potential causes of failure:

- a. The attendees only sit and listen.
- b. There is a broad diversity of interest among the attendees. This affects the speaker as well as the attendees.
- c. The speakers' backgrounds and experiences differ significantly from that of the attendees.
- d. The discussion groups are large.
- e. The attendees are allowed to come and go as they please.
- f. Strong interpersonal ties are not developed early in the conference.
- g. The attendees are incapable of producing the products desired of the conference.

Selecting the topic

Having isolated those probable causes of failure, the researchers began developing an outline for a conference that would meet an urgent need in information dissemination. They selected Computer-Aided Design in Structural Engineering (CADSE) as a high need area. Early in 1975, with the support of the Computation and Analysis Branch and Structures Branch, CWD, the Advanced Technology Branch, MD, and the EIDSO, they began developing the guidelines for this experiment in information dissemination, the Corps-wide Conference on CADSE.

Guidelines for the Conference, Planning

Success factor

Planning for the Conference involved developing guidelines to avoid the failure causes and meet established objectives. Those guidelines are thought to be the major reasons for the success of this Conference. They are presented in the following paragraphs, not only because they show how this Conference was planned, but with the view that they can be applied with equal effectiveness to other conferences having similar objectives.

Restricted scope

The scope of the Conference was limited to computers as they apply to design and analysis tasks in structural engineering. This narrow choice was a difficult one to make and produced cries of "foul" from some quarters. Questions such as "Why not soils people also? Why don't we discuss design criteria?" and "What about computer equipment?" were typical.

In spite of the valid objections of those who were kept out, the choice proved to be a wise one. This is indicated by the fact that even with such a narrow focus there were many complaints of "not enough time" to discuss a topic. The narrow scope kept everyone on the subject of computer-aided design of structures.

Common interests

Since the scope of the Conference was limited to computers in structural engineering, the attendees were also constrained to those interested in both topics. This gave engineers who were meeting for the first time work-related topics of mutual interest on which to begin their discussions.

Involvement for instant dissemination

"The best way to achieve instant dissemination is to get Corps people together and start them talking about Corps problems in computer-aided design in engineering." This view is the basis of the makeup of the CADSE Conference, hence the theme--"Corps people to solve Corps problems." Two elements (besides getting the people together) were provided to produce those results:

- a. Every attendee was required to take an active role in the Conference.
- b. The subjects selected were those known to be interesting to the attendees.

Producing useful products

Many conferences collect written copies of the papers presented, and add a preface, summary, and table of contents and publish them as the proceedings of the conference. Plans for this Conference called for

developing products that are useful to the working level engineers, their supervisors, and engineering managers at all levels.

In order to produce those products the attendees were selected so that both working level and supervisory personnel from both Automatic Data Processing (ADP) and structural engineering were represented. Also included were several top-level managers. Thus, the attendees at the Conference were the same people who would originate and approve the innovative actions needed to implement the recommendations of the Conference.

Conference format

Having those high goals, the problem of meeting them was approached through the design and conduct of this special-purpose Conference. The format was designed to stimulate the people to take an active part in the Conference. Some events took place in general sessions with everyone attending, while others were in speciality sessions attended by small groups. The details of the Conference are discussed in Part IV.

PART IV: CONFERENCE PLANNING AND THE GENERAL SESSIONS

Conference Preparation

The CADSE Conference was held in the Braniff Place Hotel in New Orleans, 22-26 September 1975. The Conference was the culmination of eight months of planning and preparation that involved all the field offices of the Corps, OCE, and WES. The New Orleans District acted as hosts for the Conference. A 12-member organizing committee, consisting of representatives from OCE, WES, and the New Orleans District and a 6-member coordinating committee worked on planning and organizing the Conference. The preparations were really a successful experiment in dissemination with coordination between the organizers and 25 moderators, 13 division speakers, 4 invited speakers, 4 technical speakers, 10 session chairmen, and 5 local arrangement contacts. The coordination was done by extensive correspondence, over 2000 telephone calls, and periodic release of Conference news through a publication called "Update Notes."

The Conference

The Conference was attended by 175 people including 107 design engineers (about two-thirds of the participants), 58 supervisors (about one-third of the participants), and 10 OCE managers. All Corps offices in the CONUS area were represented. A representative from the Pacific Ocean Division and one observer each from the Bureau of Reclamation and the Tennessee Valley Authority also attended. Eight vendors participated in the vendor display during one afternoon in the Conference. Special evening and ladies' activities were arranged for the participants and the more than 80 ladies who came with them.

The Conference was divided into general and speciality sessions with invited speakers and technical presentations added between. The general sessions featured the Division speakers, technical and invited presentations; these were attended by all participants. The speciality

sessions were designed for smaller groups and were repeated several times. Details on these sessions are discussed in Part V. An agenda for the Conference is included in Appendix A.

Management cares, invited speeches

Top-level representatives from OCE were asked to speak to the entire group on subjects related to CADSE in the Corps. By this means, the top-level people were viewed by the field engineer as being more than the "big boss in Washington." They became identified as concerned engineers who care about computer-aided design and its future in the Corps. Topics included a keynote address on "Structural Design in the Corps," a presentation on "The Role of Computers in Civil Works Design," and "Computer Support for Engineers."

Getting to know the Corps, general session

Many engineers spend their entire professional life in one Division or one District office. They never get to hear firsthand about what is going on in other offices. To overcome this, the general sessions included a speaker from each Division office who described the kind of work they do, the use of computers in design and analysis, and the problems they face in CADSE. Those speakers helped everyone see the big picture of CADSE throughout the Corps. They showed the common features of CADSE and brought out the innovative developments of each Division. Eleven division presentations were made in the Conference. A list of Division speakers is included in Appendix B.

Technical presentations

The general sessions included a few technical presentations on topics which are new and emerging in the Corps. These topics included "Computer Graphics," "Finite Element Analysis of Structures," "The Conversationally Oriented Real-Time Programming System (CORPS)," and "Computer-Aided Design of Bridges." All the presentations were made by Corps engineers, thereby relating the new advancements to Corps problems. Publication of the technical presentations is planned, along with the invited speeches, as a separate volume of the Proceedings of the Conference.

Coordinating the speakers' presentations

One of the most frightening aspects of preparing for this Conference was that so many people were taking major parts in it. How could speakers from every Division in the Corps be guided into making a coordinated series of presentations on CADSE? The problem was further compounded by the fact that the organizers would be giving guidance to mature managers. The organizers were concerned that the speakers might be offended by efforts to change the emphasis of their presentations from local interests toward Conference goals. Those fears proved to be groundless; the speakers were highly receptive to suggestion, they worked hard on drafts and redrafts, and they made adequate to excellent presentations. Two vehicles were used to produce those results. One was a document titled "Guidelines for Speakers." The other was the speakers meeting.

Guidelines for speakers

That three-page guideline document (see Appendix C) set out content, coverage, and presentation suggestions. It also included comments designed to help the speaker tailor his talk to audience and Conference objectives.

Speakers' meeting

The Division speakers (and the speciality session moderators) met the day before the Conference. The organizers reviewed the Conference goals and told the speakers how their talks should contribute to them. Equally important was the spirit generated by emphasizing the high potential benefits of the Conference, the major part they would play in the Conference, and that its success or failure was in their hands. The organizers stressed the need to adhere to the strict time limitation placed on each talk and answered the few remaining questions that had not been resolved.

This pre-Conference "pep talk" inspired the speakers to do a good job. Several speakers burned some midnight oil rehearsing and making last-minute changes to their talks. It also established a spirit of,

"We are all in this together and must help each other do the best we can."

Quality of the presentations

The organizers were concerned that the speakers might be unskilled in public speaking, since there are many outstanding engineers who are never called upon to speak to more than a dozen people and then only on their technical speciality. The challenge of informing and entertaining 175 people from all parts of the Nation was indeed a great one. It was a challenge well met by most speakers. Steps which might overcome the few problems that surfaced are outlined in the next paragraphs.

Evaluation and comments on the Division presentations

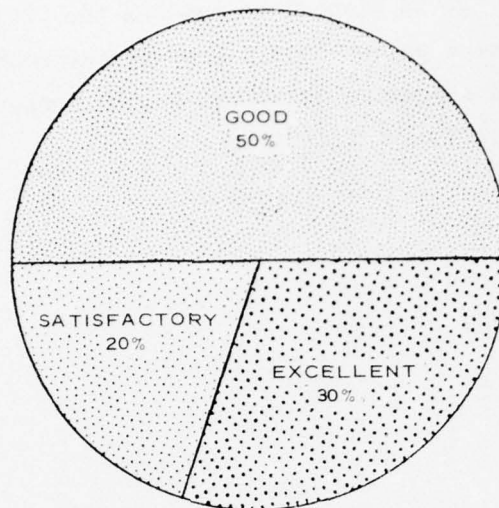
The Division presentations were evaluated by the participants for both presentation and their technical content and relevance. It can be observed from Figure 1 that 80% of the participants felt that the presentations were good or excellent, 20% felt they were satisfactory, and less than 1% felt they were unsatisfactory. The same figure also indicates that 57% of the participants rated the relevance as high, 43% as medium, and less than 1% as low. A summary of all the responses for both Division and technical presentations is included in Appendix E.

While the overall performance ratings for the Division presentations were good, the organizers do feel that the listenability of the talks could have been better if a rehearsal had been conducted prior to the Conference. The rehearsal would have:

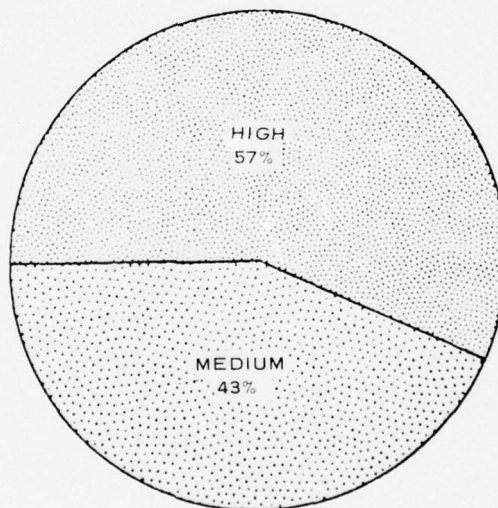
- a. Relaxed the speakers by letting them go through their talks in "public."
- b. Let the speakers learn by seeing the mistakes others make.
- c. Provide an opportunity for the organizers to improve speaking techniques (speak into the microphone, avoid reading from prepared text, let your slides talk for you in contrast to you talking about the slides, etc.).

Recommendations of Division speakers

The Division speakers gave tentative recommendations on means to improve computer-aided design in structural engineering in the Corps during the final day wrap-up of the Conference. These recommendations,



(UNSATISFACTORY < 1%)
GENERAL SESSIONS



(LOW < 1%)
SPECIALITY SESSIONS

Figure 1. Conference evaluation presentation

along with those of one supervisor, are included in Appendix G and summarized in Part VI. It is planned to publish the Division papers in a separate volume. These papers should provide information on the achievements, problems, and suggested solutions to the computer-aided design of structures in the individual Divisions.

PART V: CONFERENCE SPECIALITY SESSIONS

Concept

The speciality sessions were quite different in makeup, conduct, and objective from those usually found in technical conferences. Their purpose was to identify the Corps current capability, immediate needs, long-term needs, and current problems in CADSE. They were designed as participative sessions rather than sit-and-listen sessions (with the exception of one session called the Learning/Demonstration Session). The idea was to exchange information on computer programs and concepts among engineers from the various Corps offices.

Features of the Speciality Sessions

To meet the objectives outlined in the previous paragraph, speciality sessions were designed to meet the following requirements:

- a. Seven speciality topic areas (see next paragraph) were selected. The participants were given the option to attend any five out of these seven areas.
- b. Only 30 to 35 engineers were allowed to attend any one session at a time; five parallel (concurrent) sessions were conducted.
- c. The sessions were repeated often enough so that every person who wanted to attend had an opportunity to do so.
- d. Attendance at each session was regulated by a previously prepared schedule to avoid overcrowding and to separate engineers and their local supervisors (to promote free exchange of views).
- e. Each session was led (moderated) by two or more of the Corps most capable engineers who had considerable experience in the area of speciality.
- f. The same moderators led each of the repeated sessions to provide continuity.
- g. The session format was divided equally among:
 - (1) Moderator's presentation of the State-of-the-Corps-Art (SOCA) in the subject area.
 - (2) A discussion of capability, needs, and problems.

- (3) Development of recommendations to be included in the moderator's summary report on capability, needs, and recommendations.

Preplanning for the Sessions, Structures-Type Questionnaire

In April 1975, the organizers of the Conference prepared a questionnaire listing the different types of structures that are commonly designed in the Corps. The questionnaire included 22 major structure types with 135 environmental and loading conditions. The objectives of the questionnaire were to:

- a. Find out what structure types and how many of each type were designed in the Corps.
- b. Learn what computer programs, if any, are used in the design/analysis of each structure type.
- c. Provide sufficient data to enable the organizers to select the most interesting speciality session topics.

The questionnaires were sent to all District and Division offices in the Corps. Forty-eight (out of the 51) field offices queried completed the questionnaire. A copy of the questionnaire, including a total summary of all responses, is included as Appendix F of this report.

The general conclusion from the questionnaire was that the Corps is involved in the design of a full spectrum of civil engineering structures rather than some specialized structures. The wealth of data gathered on the computer-aided design of structures can be used as input to the Corps long-range plans.

Session Topics

Based on the questionnaire responses and after the elimination of minor structure types, the technical committee for the Conference came up with a preliminary grouping for seven speciality topic areas. This grouping was refined and completed, based on the moderators' recommendations when they met at WES two months before the Conference (July 1975) for a pre-Conference planning meeting. The final speciality topic areas were:

- a. Gravity Monoliths and U-Frames (Locks and Channels).
- b. Gates, Stoplogs, and Trashracks.
- c. Single- and Multiple-Cell Conduits and Tunnels.
- d. Pile Foundations and Sheet Pile Cells.
- e. Sheet Pile Walls and T-Walls.
- f. Stiffness Methods, Frames, and Military Construction.
- g. Earthquake and Dynamic Analyses.

Learning/Demonstration Session

A special speciality session called the Learning/Demonstration Session was designed to demonstrate new Corps advancements in computer-aided design that may interest the structural engineer. The following demonstrations were included in this session:

- a. Interactive Graphics Programs for Corps Structural Engineers.
- b. Interactive Graphics in Architecture and Space Planning (CERL's SEARCH System).
- c. Introduction of and Use of the Corps Computer-Aided Design Library (CORPS).

All the participants were required to attend this session. The sessions were very effective as there were no more than 15 persons attending any single demonstration at any one time.

Selecting and Preparing the Moderators

The single item on which the success of the Conference hinged was the effectiveness of the speciality session moderators. It was a challenging yet interesting job for the organizers. The tasks were to locate technical experts from throughout the Corps, divert them from their current design and analysis work, interest them in preparing for and conducting a speciality technical session, educate them in Conference objectives and guide them in their effort to meet those objectives.

While each of those tasks appeared formidable, they proved to be rather easy to accomplish. That ease was due largely to the dedication,

commitment, and hard work of the moderators. In selecting the moderators, consideration was given to provide broad geographic representation so that all field offices of the Corps would feel an intense involvement in the Conference. The 25 moderators selected (see Appendix B) were comprised of 13 working level engineers, 8 supervisory structural engineers, and 4 OCE engineers from Civil Works Directorate (CWD) and Military Construction Directorate (MCD). This selection, as may be noticed, was very balanced and contributed to the success of the speciality sessions.

Moderators Planning Meeting

Once the moderators had been selected, they were called to a planning meeting at WES eight weeks before the Conference. They were briefed on their role in the Conference (see Appendix D for handout given) and its objectives. Background material on each topic gathered from the responses to the structure-type questionnaire and other computer library sources were provided for the moderators. They then broke up into small groups and prepared the basic outline and organization of the speciality session for each topic. In less than two days, preparation for the technical side of the Conference went from near zero to an organized approach with dedicated experts committed to pursue it.

The remaining preparation took place by written correspondence, telephone conversations, and concluded at the speakers' and moderators' meeting the day before the Conference. By then, the moderators were ready for the sessions. Additional coordination and instruction was given during coffee and lunch breaks to iron out problems that surfaced during the first few sessions.

During the Conference

Twenty-five speciality sessions were offered in the seven topic areas mentioned before. Each participant was given an individual

schedule indicating the sessions he would attend and the place and time of each session.

Evaluation and comments
on speciality sessions

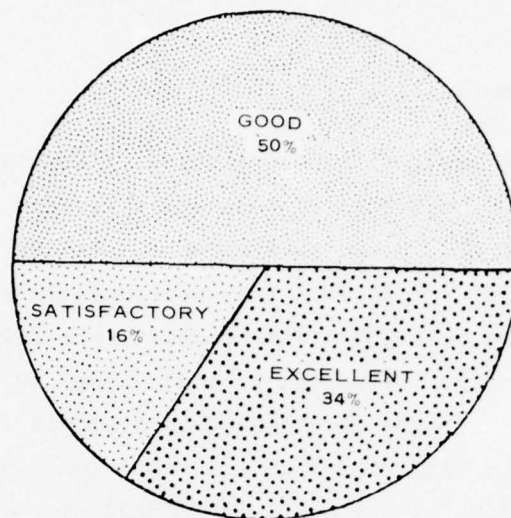
The speciality sessions were evaluated by the participants for both presentation and technical content and relevance. From Figure 2 it can be observed that 84% of the participants felt that the presentations were good or excellent and 1% felt they were unsatisfactory. The same figure also indicates that 98% of the participants felt that the relevance was medium to high with about 2% indicating low relevance. A summary of all the responses is included in Appendix E.

One of the generally expressed feelings about the speciality sessions was that the time allocated (1-1/2 hours) was too short. Inadequate time is a perennial complaint in all conferences and short courses. Nevertheless, the fact that so many participants expressed this feeling and the organizers who attended some of the sessions concurred with them, clearly indicated that this was a deficiency. In future conferences steps should be taken to correct this situation. Some suggestions that may improve the situation when adopted alone or collectively are:

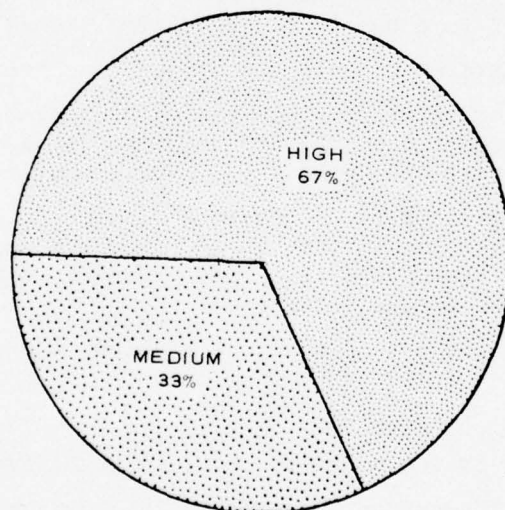
- a. Eliminate or condense the Division presentations in the general sessions and distribute the time saved to speciality sessions (make them 2 to 2-1/2 hours each).
- b. Provide copies of the moderators' State-of-the-Corps-Art papers to all participants 2 to 3 weeks ahead of the conference. This would enable them to prepare for meaningful discussions during the sessions.
- c. Have fewer topics and make the sessions longer.

Products from speciality sessions

The moderators of the sessions provided tentative recommendations evolving out of their sessions during the final day wrap-up of the Conference. These are included in Appendix H. The State-of-the-Corps-Art (SOCA) papers prepared by the moderators are planned to be published, along with the recommendations of the moderators, in several separate volumes (one volume for each group of session topics). This would enable ease of reference to readers. Each of the SOCA papers not only



(UNSATISFACTORY < 1%)
GENERAL SESSIONS



(LOW < 1%)
SPECIALITY SESSIONS

Figure 2. Conference evaluation
relevance

summarizes the state of the art in the Corps but also provides conclusions and recommendations on available or to be developed computer programs for the design of the structures. These papers should provide concise and well developed ideas on the computer-aided design of structures. It is recommended that these SOCA papers be revised periodically to reflect the growing state of the art of computer-aided structural design in the Corps.

Vendor Displays

The vendor displays were more than computer hardware shows. They were given by firms that answered "yes" to the question, "Do you have something to show that you are sure will interest the structural engineers in the Corps?" Those who said "No" or "Maybe" were encouraged to save their money and stay at home. Those who came gave Corps-oriented presentations about their capability to improve computer-aided design of structures. The following firms participated in the displays:

- a. Boeing Computer Services
- b. Control Data Corporation
- c. General Electric Company
- d. Hewlett-Packard Company
- e. McDonnell-Douglas Automation Company
- f. Tektronix Incorporated
- g. USS Engineers and Consultants
- h. Westinghouse Electric Corporation

Summary

This Conference served the direct purpose of improving the Corps posture in CAD-E by identifying current capability and needs. The Conference was also a successful experiment. Its success suggests that other conferences of this type can be effective vehicles for establishing meaningful communication between technical and managerial levels in a common technology. While it is too early to know for sure, indications point to long-term maintenance of those channels and the resultant increase in capability through cooperation and shared knowledge.

PART VI: DIVISION RECOMMENDATIONS

A summary of the recommendations made by the Division representatives at the end of the CADSE Conference was prepared by Mr. Donald Dressler, LMVD, and is given in this part of the report. The individual recommendations of ten divisions and one supervisor's remarks are included in Appendix G.

Summary of Division Recommendations

A concerted effort should be made at all levels within the Corps, especially by management, to use the computer for design. This effort must include coordination and control of program development. However, the control measures should be of a nature that will tend to encourage rather than discourage the use of computers.

OCE's role

The selection and maintenance of existing programs and development of new programs should be directed (coordinated) by OCE. Funds should be provided, perhaps similar to R&D funding, to the office selected to perform this work. The work would consist of locating and evaluating available programs, writing or expanding a program, and preparing documentation and user's manuals. The selected office should also be prepared to provide training (on a reimbursable basis) for sophisticated programs.

Program selection should be based on the projected Corps-wide workload for the next 5 to 10 years. Selection should not be based on the interest or availability of the organizations selected to do the work. Selection may be done by a permanent Corps-wide committee having field office representatives.

The programs sponsored by OCE should be available at specified locations which can be accessed by all Corps' offices.

The best way to make field personnel aware of a recommended program is to include it in the appropriate engineer manuals (EM's). Appendixes should be issued to EM's which list and evaluate the available

programs for design of the subject structures. These programs should be considered as guidance, not a directive.

District's and Division's roles

Communication and coordination must be improved between Divisions and Districts. There is a tremendous duplication of effort which must be curtailed.

Better methods are needed in the Districts to select program topics, monitor progress, recognize problems, and account for actual costs without discouraging use of the computer.

Future Conferences

Periodic Corps-wide conferences of this type should be continued. Perhaps future conferences will be more limited in scope with different subjects covered at alternate meetings. The format of the speciality sessions could be improved by stimulating more discussion and concentrating more time on the role of computers in our design techniques. Prior review of the speciality session papers should encourage better participation in future conferences.

Miscellaneous Items

The discussion in the preceding paragraphs represented a consensus viewpoint of most Divisions. The following items appear to have merit but were not mentioned as often:

- a. The Corps should have a large efficient computer similar to a CDC 7600.
- b. Corps offices should be aware of new design techniques and advances in the state of the art should be incorporated in programs available for Corps-wide use. The effects of three-dimensional geometry and force systems and soil structure interaction deserve special consideration.
- c. It would be desirable to prepare a consolidated list of computer programs used by all Corps offices.
- d. To fully implement a plan for computer-aided design it will be necessary to have a staff of specialists in the Engineering Division. These specialists are necessary because our ADP Centers do not provide personnel to do engineering programming.

PART VII: PARTICIPANTS' EVALUATION OF COMPUTER-AIDED DESIGN

Responses to the Questionnaire

At the close of the Conference each attendee was given a questionnaire containing statements on various aspects of computer-aided design, the Conference, and computer processing resources. They were asked to indicate their reaction to each statement by marking one of the following:

- a. SA - indicating strong agreement.
- b. A - indicating agreement.
- c. R - indicating reservations, no strong feelings, etc.
- d. D - indicating disagreement.
- e. SD - indicating strong disagreement.

From those statements, the organizers have selected several that may be of interest. The overall responses to each of those statements are shown in Figure 3. In addition, several other breakdowns (overall, engineers, supervisors, etc.) were made for every statement in the questionnaire. These are included in Appendix I along with an explanation of the breakdown, a brief analysis of the responses given, and the value of, need for, and limitations of such surveys.

Significance of the Responses

There were 150 people who filled out and returned a questionnaire. Thus, a 10% response represents the views of only 15 people. Consequently, one should carefully consider the small population size when drawing conclusions from responses that differ by less than 10%. The percentages are shown to the nearest 0.1% merely as a format convenience; one must not infer that the data substantiate such a high degree of precision.

Bar Graphs

In addition to the calculated values, a bar graph of percentages

STATEMENT(1): THIS CONFERENCE SERVED A USEFUL PURPOSE.

STRONGLY AGREE	56.7%	:*****
AGREE	42.7%	:*****
NO PREFERENCE	0.1%	:
DISAGREE	0.1%	:
STRONG DISAGREE	0.1%	:
NO VOTE	0.7%	:

STATEMENT(2): FUTURE CONFERENCES OF THIS TYPE SHOULD BE PLANNED IN THE SAME WAY THIS WAS DONE.

STRONGLY AGREE	16.7%	:*****
AGREE	54.7%	:*****
NO PREFERENCE	20.0%	:*****
DISAGREE	8.2%	:***
STRONG DISAGREE	0.1%	:
NO VOTE	0.7%	:

STATEMENT(3): NATIONAL (CORPS-WIDE) CONFERENCES OF THIS TYPE ARE TOO BIG TO ACHIEVE VERY MUCH.

STRONGLY AGREE	1.3%	:*
AGREE	5.3%	:**
NO PREFERENCE	14.7%	:*****
DISAGREE	58.0%	:*****
STRONG DISAGREE	20.0%	:*****
NO VOTE	0.7%	:

Figure 3. Selected statements from conference evaluations
(sheet 1 of 10)

STATEMENT(6): INTER-DISCIPLINARY CONFERENCES OF THIS TYPE (EX.
SOIL-STRUCTURE INTERACTION) WILL BE VERY USEFUL.

STRONGLY AGREE	15.3%	*****
AGREE	50.0%	*****
NO PREFERENCE	18.7%	*****
DISAGREE	12.0%	*****
STRONG DISAGREE	1.3%	**
NO VOTE	2.7%	**

STATEMENT(8): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR
DISCIPLINES MUST BE CONDUCTED ALTERNATE YEARS.

STRONGLY AGREE	15.3%	*****
AGREE	40.0%	*****
NO PREFERENCE	16.0%	*****
DISAGREE	6.7%	***
STRONG DISAGREE	1.3%	**
NO VOTE	20.7%	*****

STATEMENT(16): THIS IS THE BEST WAY TO CONDUCT SPECIALITY
SESSIONS.

STRONGLY AGREE	7.3%	***
AGREE	47.3%	*****
NO PREFERENCE	20.0%	*****
DISAGREE	12.0%	*****
STRONG DISAGREE	2.7%	**
NO VOTE	4.7%	**

Figure 3. (sheet 2 of 10)

STATEMENT(18): IN THE SPECIALITY SESSIONS, TOO LITTLE TIME WAS ALLOWED FOR EACH TOPIC.

STRONGLY AGREE	20.7%	*****
AGREE	53.3%	*****
NO PREFERENCE	11.3%	*****
DISAGREE	12.0%	*****
STRONG DISAGREE	0.7%	*
NO VOTE	2.0%	*

STATEMENT(20): THE DIVISION PRESENTATIONS SERVED A USEFUL PURPOSE.

STRONGLY AGREE	6.0%	***
AGREE	49.3%	*****
NO PREFERENCE	21.3%	*****
DISAGREE	20.0%	*****
STRONG DISAGREE	2.7%	**
NO VOTE	0.7%	*

STATEMENT(44): SYSTEMS LIKE NASTRAN, SAP, ETC. OFFER MANY ADVANTAGES TO THE CURRENT OR FUTURE COMPUTER USER.

STRONGLY AGREE	33.3%	*****
AGREE	45.3%	*****
NO PREFERENCE	17.3%	*****
DISAGREE	1.3%	**
STRONG DISAGREE	0.1%	*
NO VOTE	2.7%	**

Figure 3. (sheet 3 of 10)

STATEMENT(45): MY ENGINEERING COMPUTER NEEDS COULD BE BETTER MET
BY INSTALLING A MINI COMPUTER AT EACH DISTRICT OFFICE.

STRONGLY AGREE	7.3%	****
AGREE	17.3%	*****
NO PREFERENCE	41.3%	*****
DISAGREE	22.0%	*****
STRONG DISAGREE	8.0%	***
NO VOTE	4.0%	***

STATEMENT(46): THE CORPS NEEDS ITS OWN CENTRALIZED COMPUTER
FACILITY.

STRONGLY AGREE	20.0%	*****
AGREE	32.7%	*****
NO PREFERENCE	32.0%	*****
DISAGREE	10.0%	****
STRONG DISAGREE	3.3%	**
NO VOTE	2.0%	**

STATEMENT(49): THE WAY OF THE FUTURE IS TO USE BOTH LARGE AND
MINI COMPUTERS.

STRONGLY AGREE	20.7%	*****
AGREE	49.3%	*****
NO PREFERENCE	16.0%	*****
DISAGREE	6.7%	***
STRONG DISAGREE	2.0%	**
NO VOTE	5.3%	**

Figure 3. (sheet 4 of 10)

STATEMENT(54): THE CORPS HAS NO COMPUTER RELATED NEEDS THAT PRIVATE FIRMS CAN NOT MEET.

STRONGLY AGREE	1.3%	1*
AGREE	14.0%	1*****
NO PREFERENCE	34.0%	1*****
DISAGREE	34.7%	1*****
STRONG DISAGREE	13.3%	1*****
NO VOTE	2.7%	1*

STATEMENT(56): THE GOOD SERVICE OF PRIVATE COMPUTERS MORE THAN JUSTIFIES THEIR HIGH COST.

STRONGLY AGREE	4.0%	1**
AGREE	15.3%	1*****
NO PREFERENCE	52.7%	1*****
DISAGREE	21.3%	1*****
STRONG DISAGREE	2.7%	1*
NO VOTE	4.0%	1**

STATEMENT(57): THE CORPS SHOULD HAVE CORPS-WIDE CENTER(S) FOR DEVELOPING AND MAINTAINING STRUCTURAL PROGRAMS.

STRONGLY AGREE	25.3%	1*****
AGREE	48.7%	1*****
NO PREFERENCE	15.3%	1*****
DISAGREE	0.0%	1**
STRONG DISAGREE	0.7%	1*
NO VOTE	4.0%	1**

Figure 3. (sheet 5 of 10)

STATEMENT(58): OUR OFFICE ADP CENTER KEEPS ME WELL INFORMED OF
COMPUTER PROGRAMS THAT ARE AVAILABLE FOR MY WORK.

STRONGLY AGREE	7.3%	****
AGREE	18.7%	*****
NO PREFERENCE	22.0%	*****
DISAGREE	38.7%	*****
STRONG DISAGREE	8.7%	****
NO VOTE	4.7%	***

STATEMENT(59): OUR OFFICE ADP CENTER GIVES ADEQUATE SUPPORT FOR
MY ENGINEERING WORK.

STRONGLY AGREE	1.3%	****
AGREE	34.7%	*****
NO PREFERENCE	22.7%	*****
DISAGREE	25.3%	*****
STRONG DISAGREE	5.3%	***
NO VOTE	4.7%	***

STATEMENT(60): PRESENT TURN-AROUND TIME FOR COMPUTER PROGRAM AT
OUR OFFICE ADP CENTER IS ADEQUATE.

STRONGLY AGREE	4.7%	***
AGREE	31.3%	*****
NO PREFERENCE	21.3%	*****
DISAGREE	38.7%	*****
STRONG DISAGREE	7.3%	****
NO VOTE	4.7%	***

Figure 3. (sheet 6 of 10)

STATEMENT(61): A COMPUTER PROGRAMMING SECT./BRANCH WITHIN THE
ENGINEERING DIV. WILL HELP ME USE THE COMP. MORE IN MY WORK.

STRONGLY AGREE	17.3%	:*****
AGREE	37.3%	:*****
NO PREFERENCE	24.0%	:*****
DISAGREE	15.3%	:*****
STRONG DISAGREE	2.0%	:**
NO VOTE	3.3%	:*

STATEMENT(62): ONE OR MORE FULL-TIME ENG. IN DIST. OFFICE NEEDED
FOR ENG. PROG. DEV. AND PROVIDING INFO. ON COMPUTER SYSTEMS.

STRONGLY AGREE	24.0%	:*****
AGREE	40.0%	:*****
NO PREFERENCE	19.3%	:*****
DISAGREE	0.0%	:**
STRONG DISAGREE	2.0%	:*
NO VOTE	2.0%	:*

STATEMENT(35): INTERACTIVE SYS. LIKE CORPS OR FACTS OFFER MANY
ADVANTAGES TO THE CURRENT ENGINEER-COMPUTER USER.

STRONGLY AGREE	12.0%	:*****
AGREE	56.0%	:*****
NO PREFERENCE	26.7%	:*****
DISAGREE	2.0%	:*
STRONG DISAGREE	1.3%	:*
NO VOTE	2.0%	:*

Figure 3. (sheet 7 of 10)

STATEMENT(37): THE NUMBER OF TERMINALS AVAILABLE IN MY OFFICE IS
INADEQUATE FOR DOING INTERACTIVE DESIGN.

STRONGLY AGREE	13.3%	*****
AGREE	34.0%	*****
NO PREFERENCE	25.3%	*****
DISAGREE	18.7%	*****
STRONG DISAGREE	0.0%	***
NO VOTE	2.7%	**

STATEMENT(53): INTERACTIVE COMPUTER GRAPHICS DEVICES WILL HAVE A
MAJOR IMPACT ON COMPUTER AIDED DESIGN.

STRONGLY AGREE	32.7%	*****
AGREE	49.3%	*****
NO PREFERENCE	14.7%	*****
DISAGREE	1.3%	**
STRONG DISAGREE	0.7%	*
NO VOTE	1.3%	**

STATEMENT(26): THE CORP SHOULD GET OUT OF THE PROGRAM DEVELOPMENT
BUSINESS AND CONTRACT THAT WORK OUT.

STRONGLY AGREE	1.3%	**
AGREE	1.3%	**
NO PREFERENCE	12.0%	*****
DISAGREE	46.0%	*****
STRONG DISAGREE	38.7%	*****
NO VOTE	0.7%	*

Figure 3. (sheet 8 of 10)

STATEMENT(32): IT IS EASY TO WRITE A GOOD USER GUIDE FOR A
COMPUTER PROGRAM.

STRONGLY AGREE	1.3%	**
AGREE	11.3%	*****
NO PREFERENCE	27.3%	*****
DISAGREE	39.3%	*****
STRONG DISAGREE	19.3%	*****
NO VOTE	1.3%	**

STATEMENT(33): MOST CORPS WRITTEN USER GUIDES ARE WELL WRITTEN
AND CLEARLY SHOW HOW TO USE THE PROGRAM.

STRONGLY AGREE	0.0%	*
AGREE	6.0%	***
NO PREFERENCE	32.0%	*****
DISAGREE	49.3%	*****
STRONG DISAGREE	11.3%	*****
NO VOTE	1.3%	**

STATEMENT(34): THE CORPS PROG. AND DOCUMENTATION STDS. ARE REAL-
ISTIC, ENG.-ORIENTED AND SHOULD BE CLOSELY FOLLOWED.

STRONGLY AGREE	1.3%	**
AGREE	21.3%	*****
NO PREFERENCE	46.7%	*****
DISAGREE	24.0%	*****
STRONG DISAGREE	3.3%	*
NO VOTE	3.3%	**

Figure 3. (sheet 9 of 10)

STATEMENT(21): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM THE PROJECT IT SERVES.

STRONGLY AGREE	0. %	:
AGREE	8.7%	****
NO PREFERENCE	22.0%	*****
DISAGREE	43.3%	*****
STRONG DISAGREE	24.0%	*****
NO VOTE	2.0%	**

STATEMENT(22): MONEY SHOULD BE PROVIDED FOR COMPUTER PROGRAM DEVELOPMENT INDEPENDENT OF THE PROJECTS.

STRONGLY AGREE	36.0%	*****
AGREE	45.3%	*****
NO PREFERENCE	15.3%	*****
DISAGREE	2.7%	*
STRONG DISAGREE	0.7%	:
NO VOTE	0. %	:

STATEMENT(24): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM OCE AS A "LINE ITEM" IN THE BUDGET TO CONGRESS.

STRONGLY AGREE	23.3%	*****
AGREE	34.7%	*****
NO PREFERENCE	34.0%	*****
DISAGREE	4.7%	***
STRONG DISAGREE	2.0%	**
NO VOTE	1.3%	**

Figure 3. (sheet 10 of 10)

is provided in the form of a row of stars (*) to the right of an initial colon. The colon marks the zero reference. Each star represents a change of 2.5%. Thus a row containing ten stars represents a percentage value between 23.75% and 26.25%. This degree of precision is more than adequate for this analysis since ranges below 5% represent the views of less than eight people. Such small samples are of highly questionable value.

Interpretation

The purpose of the bar graphs is to give an easy-to-grasp picture of the distribution of the views. From these bar graphs one can quickly identify the following conditions.

- a. Strong bias for the statement indicated by long rows of stars only in the upper part of the graph.
- b. Strong bias against the statement indicated by long rows of stars only in the disagree-strongly and disagree (lower) portion of the graph.
- c. Strong polarization of views indicated by long rows of stars in both the upper and lower portions of the graphs and few stars in the no preference row.
- d. Lack of feeling or lack of sufficient information as indicated by a concentration in the no-vote row should not be interpreted as lack of strong feeling. The reasons discussed in earlier paragraphs are the likely causes of large numbers of no-vote responses.

Other Data

The no-vote entry indicates the percentage of attendees who failed to respond to the statement. The number in parentheses that follows the word STATEMENT is for cross-reference purposes only (between the several breakdowns). These and other points are covered in greater detail in Appendix I.

PART VIII: CONFERENCE FINDINGS AND APPROACHES TO MEETING NEEDS

Areas of General Agreement

The following points have broad base support and clearly represent the findings of the Conference.

- a. The Corps has a few good programs for CADSE.
- b. The Corps has growing needs for new and improved programs for CADSE.
- c. The Corps must find an orderly way to develop and distribute programs for structural engineering. The go-it-alone procedure of having each District or Division meet its own needs is expensive, wasteful, and productive of second-rate efforts of limited usefulness. The few excellent programs available are the well done exceptions that simply serve to show what could be done if program development and information dissemination in CADSE were pursued on a defined-task basis to meet Corps-wide needs.
- d. Both OCE and the field offices have an important role to play in developing and distributing CADSE computer programs.

Approaches to Meeting Needs

Diverse views

In addition to the specific findings, other needs and approaches were developed in general terms such as forming a Structural Engineering Software Center (SESC) and funding program development. The following summary is necessarily a blending of recommendations. It is believed to be an accurate consensus of the participants findings.

A software center is needed

The idea of forming an SESC has much to recommend it as the following indicates.

- a. Other disciplines (e.g., soils, hydraulics, etc.) have information centers within the Corps.
- b. The large, general purpose computer programs (such as SAP) need to be maintained and updated.
- c. An SESC is needed as a single point of contact for structural engineers.

- d. The center can also do applied research and development in CADSE.
- e. An SESC is needed to serve Corps-wide interests first, as opposed to local work first, Corps-wide second.
- f. SESC can provide training in new developments in engineering-computer technology as they relate to structural engineering.
- g. SESC can develop new special purpose computer programs for the field offices when requested if enough manpower is available; or can provide technical monitor services for the field offices if the program development work is contracted to a university or a private industry.

Software center, functions

The SESC functions are to meet the needs outlined above. It should be under OCE direction, perhaps under the Chief, Structures Branch. There it would function as a helping hand to the field offices in CADSE problems and as a resource whose function is identified for and restricted to meeting Corps-wide needs of CADSE.

Funding procedure for program development and SESC

The findings on funding are rather broad. Suggestions such as the following are typical:

- a. Field office funding. This involves the field offices in the development, produces better end products, and can be done with existing resources. The problem area is how to distribute the cost. Should:
 - (1) Each Division provide an equal share?
 - (2) Each Division pay for what it uses (but this leaves no money for basic CADSE activity)?
 - (3) Each Division provide funds based on a percentage of its annual work?
- b. OCE funding. The appeal of this method seems to be that the activity has OCE's blessing as confirmed by its support. Sources of money are:
 - (1) A "line item" in the budget for R&D in CADSE.
 - (2) Engineering studies money.
 - (3) OCE's operating funds as obtained from the field offices (this is actually going back to the field offices).

- c. Combined funding. This approach seeks OCE funding for the basic activity of the SESC and research involved in new program development and use of field office support for program development work. The sources of OCE and field office funding would have to be identified as indicated in subparagraphs a and b, above.

Comments on funding

Underlying the total question on funding are several facts that are frequently ignored:

- a. The money is already being spent; oftentimes it is being spent more than once for the same product by different offices.
- b. The amount of money is large and growing larger (i.e., only one man-year per District exceeds \$1,000,000 per year) for the entire Corps.
- c. "He who pays the piper, calls the tune." If each field office does its own development, only rarely will that development address the needs of other offices. Corps-wide interests will be met best by involving the field offices in the funding.

PART IX: RECOMMENDATIONS

This Conference brought out many problem areas in CADSE within the Corps. High-quality, Corps-oriented, and structures-oriented solutions must be developed to resolve those problems.

The organizers have examined the problem areas in great detail and have discussed and reflected on the Divisions' and moderators' recommendations in considerable depth. They have developed a single recommendation:

FORM A PERMANENT CORPS-WIDE COORDINATION COMMITTEE CALLED COMPUTER AIDED STRUCTURAL ENGINEERING (CASE) COMMITTEE TO EXAMINE, EVALUATE, AND PROPOSE STEPS TO OVERCOME PROBLEMS IN COMPUTER-AIDED STRUCTURAL ENGINEERING THROUGHOUT THE CORPS AND TO COORDINATE AND GUIDE LONG-TERM CADSE EFFORTS ON A CORPS-WIDE BASIS.

Forming a committee is sometimes viewed as shelving a problem. Thus, the reaction to the CASE Committee might be, "Another committee. Surely, the Corps could improve CADSE by a committee, but so might other needs be met by an appropriate committee."

The organizers recognize the validity of such concerns, but they strongly believe the following to be true:

- a. The future of structural design and analysis within the Corps hinges on the effective, efficient use of computers.
- b. This task should be done by the people who know the most about it; the Corps' structures people.

The remainder of this part proposes how the committee might be formed and suggests short- and long-term activities to meet the needs brought out in the Conference (see Part VIII).

Corps-Wide CASE Committee

Organization

The proposed CASE Committee may be implemented by the following actions:

- a. Form a coordinating committee (CASE) for CADSE.

- b. The members of the committee may consist of one structural engineer from each Division office, one middle-management level structural engineer from any one District office within each Division, and members from the Corps' laboratories as appropriate. The managerial level member will serve for one year on a rotational basis so that all Districts have the opportunity to participate in the committee activities.
- c. This committee would work under and report directly to the Chief of the Structures Branch in OCE.

Advantages of the committee

The major advantages of this committee approach are:

- a. The proposal is highly workable in that it can be implemented within the Corps' existing organization and funding framework.
- b. It involves all levels of work and management.
- c. It brings together Corps-wide requirements for Corps-wide solutions.
- d. It provides a training ground for those members whose Divisions are less advanced in CADSE. This will be especially helpful for the rotating members; the middle managers.
- e. It improves the dissemination of information on program availability.
- f. It will, through shared knowledge, eliminate the unintentional duplication of effort.
- g. It assigns responsibility for identifying (planning) and provides a means for meeting long-term needs.
- h. The people who are doing the work are the Corps' most knowledgeable in the subject area (working-level computer-oriented engineers) and those most capable of producing the desired results (the middle and top managers).
- i. Top and middle management will get close insight into the new and rapidly expanding engineering-computer technology which has developed since many (most) of them had working level experience in design and/or analysis ("You can't manage what you don't understand").
- j. It will encourage the formation of CASE groups within each Division (consisting of structural engineers from the District offices within the Division) resulting in similar benefits to the District Offices.

Functions of the CASE Committee

The ongoing functions of the CASE Committee should include the following:

- a. Planning. This will include an ongoing Corps-wide review of immediate and long-term needs in CADSE.
- b. Proposing. This will include developing and obtaining approval of workable plans to meet those needs.
- c. Scheduling. This will include setting priorities for tasks so that the most important work is done with the resources available.
- d. Assignment. Through mutual agreement and/or directives, the committee will assign computer program development tasks to various Districts, Divisions, Corps' laboratories, software center, universities, contractors, etc., so as to assure their timely completion by competent practitioners.
- e. Review. The committee will review or select a review agent to see that the programs developed meet the previously developed standards and specifications.
- f. Dissemination. The committee members will, by virtue of their activity in CASE, serve as authoritative sources of information on what is available. They will provide a continuous flow of information between users, supervisors, managers, and developers.

Immediate tasks
for the CASE Committee

The following tasks must be undertaken by the CASE Committee:

- a. Select workable alternatives on funding (see Part VIII).
- b. Decide on the desirability or otherwise of formation of the Structural Engineering Software Center (SESC).
- c. Develop plans to implement their recommendations and pursue them to a successful conclusion.

Fundamental Obstacles to be Overcome by
The CASE Committee

If the CASE Committee is to succeed, two major ingredients are required. First the Committee must gain, by its actions, the confidence of managers and structural engineers throughout the Corps. The Committee must also be provided with adequate resources to implement its recommendations.

If this Committee functions under the Chief of the Structures Branch, OCE, as recommended, then it will not become an omnipotent, governing body in CADSE. Such action forces the Committee to produce

meaningful, broad base recommendations. Thus, good ideas will carry the full weight of the Branch Chief; bad ideas will be returned to the Committee for improvement. Consequently, the first task of the Committee is to present a workable, well conceived plan for program development to the Chief of the Structures Branch.

The second need, resources, involves finding a way to get money for program development. "There is no such thing as a free lunch," nor is there free help for CADSE. The costs of developing computer programs are real, but thus far they have been largely unidentified since they are often bootlegged from the R&D costs for approved projects. Some of the funds currently being spent inefficiently on program development by the field offices should be pooled for projects proposed by the CASE Committee.

Comments on the CASE

If the CASE Committee can establish itself by virtue of good planning and is given the resources to meet well established needs, then the Corps will maintain its professional level of skill in design and analysis. If it and succeeding efforts fail, then the fundamental wastes of marginal quality and duplication of effort may reduce the Corps of Engineers to the "Corps of Clerks." There is concern throughout the Corps that the best efforts of those "engineering clerks" will be to monitor contracts for products which they only slightly comprehend.

Such views stem from an obviously biased group, the computer-oriented engineers. If the growth of CADSE over the past few years is any indicator of future trends in design and analysis, then their concerns may warrant careful attention, lest the Corps find truth in such forecasts.

APPENDIX A: CADSE AGENDA

Monday, 22 September 1975

- 3:00 p.m. Moderators' and Division Speakers' Organization Meeting -
Meeting Room #6
- 6:30 p.m. Registration and Icebreaker Party - Terrace Suites 1&2,
to Sixth Floor
- 8:30 p.m.

Tuesday, 23 September 1975 - Tulane Room - Lower Mezzanine Floor

- 8:00 a.m. Registration - Outside Tulane Room
- Session 1 - Chairman - Mr. Donald L. Neumann, WES
- 9:00 a.m. Welcome to New Orleans - COL Early Rush,
District Engineer, NOD
- 9:15 a.m. Welcome to Conference - COL George H. Hilt,
Director, WES
- 9:30 a.m. Keynote Address - "Structural Design in the Corps - An
Overview" - Mr. Charles F. Corns, OCE
- 10:00 a.m. Coffee Break
- Session 2 - Chairman - Mr. Lucian G. Guthrie, OCE
- 10:30 a.m. Conference Scope and Format - Dr. N. Radhakrishnan, WES
- Division Paper I
- 10:45 a.m. North Atlantic Division - Mr. Alvis Eikstrems, NAD
- Division Paper II
- 11:15 a.m. New England Division - Mr. William J. Holtham, NED
- 11:45 a.m. Lunch
- Session 3 - Chairman - Mr. James B. Cheek, Jr., WES
- 1:00 p.m. Computer Aided Design System for the Corps - CORPS/FACTS
System - Mr. Richard L. Delyea, OCE
- Division Paper III
- 1:30 p.m. Huntsville Division - Mr. Robert M. Wamsley and
Mr. Frederick J. Bourgeois, HND
- Division Paper IV
- 2:00 p.m. LMVD - Mr. Donald R. Dressler, LMVD
- 2:30 p.m. Coffee Break
- Session 4 - Chairman - Mr. Donald R. Dressler, LMVD
- 3:00 p.m. Finite Element Analysis of Structures -
Dr. N. Radhakrishnan, WES, and Mr. Carl J. Smith, LMS

Division Paper V

4:00 p.m. Ohio River Division - Mr. Stephen F. LeMaster, ORD

Division Paper VI

4:30 p.m. Missouri River Division - Mr. Robert J. Hunt, MRD

5:00 p.m. Technical Session End

6:30 p.m. Busses leave Hotel for Mississippi River Harbor Cruise

7:00 p.m. to River Cruise

9:00 p.m.

Wednesday, 24 September 1975 - Tulane Room - Lower Mezzanine Floor

Session 5 - Chairman - Mr. Richard F. Malm, OCE

8:00 a.m. Role of Computers in Civil Works Design -
Mr. Homer B. Willis, Chief, Engineering Division,
Civil Works, OCE

Division Paper VII

8:30 a.m. North Central Division - Mr. John P. D'Aniello, NCD

Division Paper VIII

9:00 a.m. South Atlantic Division - Mr. James G. Lewis, SAD

9:30 a.m. Coffee Break

Session 6 - Chairman - Mr. William A. Price, WES

10:00 a.m. Computer Graphics for Engineers - Mr. James B. Cheek, Jr.,
WES

Division Paper IX

10:45 a.m. South Pacific Division - Mr. James Tanouye and
Mr. Robert Haavisto, SPD

Division Paper X

11:15 a.m. North Pacific Division - Mr. David Ross, NPD

Division Paper XI

11:45 a.m. Southwestern Division - Mr. C. F. Berryhill, NPD

12:15 p.m. Lunch

Session 7 - Chairman - Dr. N. Radhakrishnan, WES

1:30 p.m. Computer Aided Design of Bridges - Mr. William Ashton, NCR

2:10 p.m. Organization of Speciality Sessions - WES

2:20 p.m. Coffee Break

Session 8

2:45 p.m. *Speciality Session I (Parallel Sessions)
4:15 p.m. End of Session 8
4:20 p.m. Busses will leave Hotel for Superdome Tour
4:45 p.m. Superdome Technical Tour
6:30 p.m. Busses will leave Superdome for West End
7:00 p.m.
to Dinner at West End Restaurant
9:00 p.m.

Thursday, 25 September 1975

Session 9 - Chairman - Mr. Donald Baldwin, OCE

8:15 a.m. "Role of Computers in Military Construction Design" -
Mr. Lee S. Garrett, Chief, Engineering Division, Military
Construction, OCE
8:45 a.m. Speciality Session II (Parallel Sessions)
10:15 a.m. Coffee Break

Session 10

10:45 a.m. Speciality Session III (Parallel Sessions)
12:15 p.m. Lunch (Computer Vendor Display will be open)

Sessions 11 and 12

1:30 p.m. Speciality Session IV (Parallel Session)
3:00 p.m. Computer Vendor demonstration of Structural Engineering
to Programs and Display of Hardware - Tulane Room - Lower
6:30 p.m. Mezzanine
Free Evening

Friday, 26 September 1975

Session 13 - Chairman - Mr. Robert A. McMurrer, OCE

8:15 a.m. Computer Support of Engineers - COL Patrick W. Marks,
Chief, EIDSO, OCE
8:45 a.m. Speciality Session V (Parallel Sessions)
10:15 a.m. Coffee Break

Session 14 - Chairman - Mr. Keith O'Donnell, OCE, and
Dr. N. Radhakrishnan, WES

* All Speciality Sessions will run parallel in Meeting Room 1 in Lower Mezzanine and Meeting Rooms 2, 3, 4, 5, 9, and 10 on the second floor.

10:45 a.m. Wrap-up and Evaluation - WES/OCE
 Supervisors' Remarks
 Moderators' Remarks
 Participants' Remarks
 Evaluation
 Closing Remarks
12:15 p.m. Conference Adjourns

APPENDIX B: CADSE, LIST OF DIVISION SPEAKERS AND MODERATORS

Division Speakers

- | | |
|--|--|
| 1. Robert M. Wamsley
Huntsville Division | 8. David Ross
North Pacific Division |
| 2. Frederick J. Bourgeois
Huntsville Division | 9. Stephen F. LeMaster
Ohio River Division |
| 3. James G. Lewis
South Atlantic Division | 10. James Tanouye
South Pacific Division |
| 4. Alvis I. Eikstrems
North Atlantic Division | 11. Robert Haavisto
South Pacific Division |
| 5. C. F. Berryhill
Southwestern Division | 12. Donald Dressler
Lower Mississippi Valley Division |
| 6. Robert J. Hunt
Missouri River Division | 13. William J. Holtham
New England Division |
| 7. J. P. D'Aniello
North Central Division | |

Speciality Session Topics and Moderators

A. T-Walls, U-Frame Locks, and Channels

Moderators: 1. T-Walls

Raymond Veselka, Galveston District

2. U-Frames (Locks)

Charles M. Hargett, Vicksburg District

3. U-Frames (Channels)

James W. Simmons, Baltimore District

B. Gates, Stoplogs, and Trashracks

Moderators: 1. Roller Gates, Wheel Gates, Trashracks

William D. Churchill, Missouri River Division

Lloyd E. Sell, Omaha District

2. Tainter Gates

Keith O'Donnell, OCE

3. Miter Gates, Stoplogs

James E. Gibson, Mobile District

C. Conduits, Culverts, and Tunnels

Moderators: 1. Conduits

George W. Henson, Tulsa District

2. Culverts

Carney M. Terzian, New England Division

3. Tunnels

Robert J. Smith, OCE

D. Pile Foundations and Gravity Monoliths

Moderators: 1. Pile Foundations

Billy H. James, Southwestern Division

Thomas J. Mudd, St. Louis District

2. Gravity Monoliths

Norman W. Wilke, Walla Walla District

E. Sheet Pile Walls and Cells

Moderators: 1. Sheet Pile Walls

Walter D. Judlin III, New Orleans District

2. Sheet Pile Cells

Herman Gray, Nashville District

F. Bridges and Military Construction

Moderators: 1. Bridges

William D. Ashton, Rock Island District

2. Military Construction (Building Frames, etc.)

Daniel Reynolds, Sacramento District

Donald B. Baldwin, OCE

G. Earthquake and Dynamic Analysis

Moderators: 1. Lucian Guthrie, OCE

2. Michael E. Dembo, Huntsville Division

3. Mr. Dean Norman, WES

H. Learning and Demonstration

Interactive Graphics - Robert L. Hall, WES, Bruce Dains, CERL, and
Dave Siles, CERL

Computer-Aided Design Library (CORPS) - H. Wayne Jones, WES

APPENDIX C: GUIDELINES FOR DIVISION PRESENTATIONS AT THE
SEPTEMBER CONFERENCE ON COMPUTER-AIDED DESIGN
FOR STRUCTURAL ENGINEERS

Background

We have had a chance to read a few of the rough draft papers for the Divisions' presentations. Each paper was strong in some areas and weak in others. Taken together they have helped us consolidate our thoughts on what we see as needed to meet the Conference objectives.

We have prepared a list of statements and questions that may help you tailor your presentation for specific objectives. We do not expect each paper to follow the outline exactly. However, we do believe the points should be carefully weighed and where applicable used in preparing, evaluating, and revising your presentation.

Guidelines

1. Be sure to introduce your Division.
 - a. Who are you?
 - b. Where do you work?
 - c. What types of problems do you work on?
 - d. What fraction of your work is done by contractors/consultants?

Remember that a least 2/3 of the attendees are from another part of the country. They may not even know where the Galveston District is, much less its concern for hurricane protection and structure corrosion. Be sure to include the major geographical and environmental factors that influence your work. Slides (color) that show places and things would be nice (ice-covered structures, major storms, rivers, locks, failures, etc.).

2. The use of computers in the design and analysis of structures. Describe projects, types of computer service used, cost savings, design improvements, etc.

3. Speak to both engineers and their managers. At least 1/3 of the attendees will be engineering managers. They will want to hear about problems that need solving to get work done on time for less money. This is a great opportunity to get your views down on paper and up to OCE where the common problems can be identified and resolved.

4. The means the Division uses for disseminating information about programs. Tell how new developments are started, improvements made known, old programs cast out. Discuss areas of structural design where more computer programs are needed, etc. Discuss past, present, and future efforts in this area.

5. What are your views on encouraging and controlling the development of computer programs for structural engineering?

- a. Are encouragement and control procedures needed?
 - b. Do you have any? Do they work?
 - c. What kind of coordination and control procedure do you recommend - for a Division? - for the Corps as a whole?
 - d. What are the short-term and long-term needs for programs and for policy regarding encouragement and control?
6. Would program development be done by:
- a. Districts, on assignment - with money? - without money?
 - b. Districts, at their own initiative?
 - c. Division-level people
 - (1) with other duties in office?
 - (2) permanent assignment to computer program work?

7. What computer programs used or developed in your Division do you consider good? Why? What programs do you consider useless? Why? What should be done to them (or should they be abandoned)? What worked? What did not work? Why? Recommendations?

8. What problems have you experienced in program usage? What problems have you experienced in equipment use?

9. What programs do you have that are not used as much as you think they should be? Why not? Recommendations?

10. Place lists of programs in appendix.

11. Be prepared to use visual aids, including Vu-graphs (overhead

projectors) or slides or flip charts, etc., to illustrate your paper. Show printouts that are arranged for direct binding into design memorandum reports, etc. If you use a flip chart, it should be readable at a distance of 40 feet.

12. Call Dr. N. Radhakrishnan, FTS telephone 601-636-2182, if you have any questions or problems connected with your paper.

APPENDIX D: SPECIALITY SESSIONS ROLE AND FUNCTIONS OF MODERATORS

Role of Moderators

The moderators will be the key element in the success of the Conference. They play an important role in molding individual viewpoints of participants into a recommended consensus for review of Corps engineering management personnel.

Functions of Moderator

I. Pre-Conference

A. Each moderator will be given a summary of the responses to the Questionnaire obtained from various Corps offices on the particular structure type to which the moderator is assigned. The summary will also include a list of computer programs used by the offices in the design/analysis of the particular structure. Based on this summary the moderator should obtain supplemental information on:

1. Write-up on computer programs mentioned in the Questionnaire responses including programs not published.
2. Other computer programs that the moderator may know as useful in the design/analysis of the particular structure type.
3. Collect information on other computer programs listed in the Engineering Computer Programs Library (ECPL), WESLIB, INFONET, or other sources.

B. Each moderator will prepare a written paper on the "State-of-the-Corps-Art" (SOCA) on the computer-aided design of his assigned type(s) of structure. Papers to be ready by 10 September 1975. The paper should at least include the following: (There is no limit as to the length of this paper.)

1. Design philosophy and procedure in the Corps.
2. Differences between the Corps procedure and the state of the art in industry (i.e., constraints in design added by the Corps).

3. The role of computers in the design/analysis.
4. Lists of available programs and offices that are involved in the design of this structure.
5. Discuss which programs may be suitable for adaptation to Corps-wide use. If no programs are found suitable, discuss specific recommendations regarding the desired features and ingredients that a good computer program should have to be used in the design/analysis of this type of structure.

II. During Conference

A. Each moderator presents, at the start of each speciality session meeting, a summary of his paper. The use of viewgraphs or slides for this presentation is highly recommended. The total time allocated for this presentation in a session is 40 minutes. Note that this is the total time and if there are two or three moderators for the session the time has to be shared between the moderators.

B. Open up the presentation and paper for discussion from the participants. (Moderator should take notes for publication in the proceedings; a tape recorder will be available.) Discussions can be on any area of the paper including comparisons of different programs, recommendations for new programs or improvement of an existing program, changes needed in the design philosophy of the structure type, etc.

C. Moderator closes discussion with a short wrap-up (3 minutes).

D. Maintains some continuity between sessions.

E. The final wrap-up session of the Conference (Friday, 11:00 a.m.) will have a portion devoted for moderator's comments. The moderator should prepare some summary comments for this session.

III. Post-Conference

A. Moderator follows up on any thoughts or sources suggested by the participants.

B. Revises and enlarges his paper to include comments and recommendations of the participants in the speciality sessions, and the follow-up work he did. Submit the paper for publication in the proceedings (November 15, 1975).

APPENDIX E: CORPS-WIDE CONFERENCE ON CADSE

Conference Evaluation Questionnaire

Summary

Day	Title	Presentation				Relevance		
		E	G	S	U	H	M	L
TUE	Structural Design in the Corps, An Overview	28	82	39	1	88	56	5
	North Atlantic Division Paper	63	74	14	0	79	67	2
	New England Division Paper	21	87	41	1	74	73	3
	Computer Aided Design System for Corps, CORPS/FACTS System	24	91	32	2	94	45	1
	Huntsville Division Paper	5	50	87	9	35	89	27
	Lower Mississippi Valley Division Paper	44	75	28	1	99	39	1
	Finite Element Analysis of Structures (Radha)	101	29	10	0	116	25	0
	Finite Element Analysis of Structures (Smith)	26	77	36	0	84	55	0
	Ohio River Division Paper	8	68	56	5	38	85	13
	Missouri River Division Paper	50	74	14	0	82	56	0
WED	Role of Computers in Civil Works Design	30	81	29	0	82	58	3
	North Central Division Paper	76	62	11	0	106	32	1
	South Atlantic Division Paper	26	91	28	0	56	69	4
	Computer Graphics for Engineers	106	29	4	0	117	23	0
	South Pacific Division Paper	15	81	34	6	62	68	7
	North Pacific Division Paper	32	74	34	0	74	60	6
	Southwestern Division Paper	22	68	44	5	63	68	8
	Computer Aided Design of Bridges	78	44	11	0	97	35	1
	Superdome Technical Tour	55	31	21	1	35	43	25
THU	Role of Computers in Military Construction Design	9	28	20	11	22	20	10
FRI	Computer Support for Engineers	30	67	27	1	80	43	3

Note: E = Excellent, G = Good, S = Satisfactory, U = Unsatisfactory, H = High, M = Medium, and L = Low.

Speciality Sessions Evaluation

Topic		Presentation				Relevance		
		E	G	S	U	H	M	L
A. Gravity Monoliths, U-Frames (Lock and Channels)								
1.	Gravity Monoliths	21	46	14	2	54	24	2
2.	U-Frame Locks	37	36	8	0	56	21	0
3.	U-Frame Channels	24	47	9	0	54	21	3
4.	Overall Section	27	42	6	1	55	20	0
B. Gates, Stoplogs, and Trashracks								
1.	Tainter Gates	13	37	17	0	41	22	3
2.	Roller Gates, Wheel Gates, Trashracks	22	33	10	0	41	23	3
3.	Miter Gates, Stoplogs	22	35	15	0	44	21	2
4.	Overall Section	15	39	12	0	39	26	1
C. Single and Multiple Cell Conduits, Tunnels								
1.	Single-Cell Conduits	26	38	7	0	43	27	1
2.	Multiple-Cell Conduits	17	39	3	1	41	26	4
3.	Tunnels	16	36	15	5	36	28	5
4.	Overall Section	20	35	12	0	39	26	2
D. Pile Foundations, Sheet Pile Cells								
1.	Pile Foundations with Rigid Caps	28	43	8	0	55	23	0
2.	Pile Foundations with Flexible Caps	26	44	8	0	55	23	0
3.	Sheet Pile Cells	28	45	10	0	52	24	1
4.	Overall Section	25	42	10	0	53	23	0
E. Sheet Pile Walls, T-Walls								
1.	Sheet Pile Walls	29	40	11	3	56	27	1
2.	T-Walls	21	41	19	1	54	28	2
3.	Overall Section	22	42	20	1	52	28	1
F. Bridges, Frames, Military Construction								
1.	Bridges	24	24	6	4	38	17	3
2.	Frames	19	32	12	3	40	23	3
3.	Military Construction	14	25	16	7	24	27	11
4.	Overall Section	17	31	10	4	33	22	4
G. Earthquake and Dynamic Analysis								
1.	Earthquake Analysis	17	26	10	0	33	16	2
2.	Dynamic Analysis	18	23	12	0	31	18	4
3.	Overall Section	17	27	12	0	37	14	5
H. Learning and Demonstration								
1.	Interactive Graphics (WES)	67	52	6	2	103	24	2
2.	Interactive Graphics (CERL)	58	50	17	2	64	41	11
3.	Computer-Aided Design Library (CORPS)	57	56	11	2	102	20	3

Note: E = Excellent, G = Good, S = Satisfactory, U = Unsatisfactory, H = High, M = Medium, and L = Low.

APPENDIX F: STRUCTURES-TYPE QUESTIONNAIRE SUMMARY

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
							Attach a brief abstract if not in library	Give the name or number of the program if in the library
	Past	Future	Civil Works	Military	(Place a mark in box if yes or attached)			
A. Concrete Dams								
1. Gravity	24 (10)*	19 (9)	19 (12)		4 (4)	2 (2)		713-F5-D010 713-F5-C1090 713-24-050
a. Overflow	88 (17)	77 (18)	23 (21)		13 (13)	6 (6)		713-G1-K63 713-S8-K527
b. Nonoverflow	69 (14)	55 (10)	19 (18)		9 (9)	3 (3)		713-F5-C510 713-R1-A3040
2. Arch	2 (2)		3 (3)		1 (1)			713-G1-K63
3. Buttress	1 (1)	1 (1)	1		1	1 (1)		713-R1-A3150
4. _____	23 (6)	23 (5)	13 (4)		5 (5)	2 (2)		713-R1-A3840
B. Gravity Walls								
1. Foundation type								713-24-030 713-A2-014 722-S8-K518
a. Rock bearing	101 (20)	128 (15)	42 (20)		11 (11)	7 (7)	1 (1)	713-J2-H1015 741-G1-F3050
b. Earth bearing	108 (10)	60 (7)	13 (9)		3 (3)	1 (1)		713-R1-A3840 713-S8-K528
c. Pile foundation	23 (8)	18 (6)	8 (7)		4 (4)	4 (4)		713-F2-014
2. With interior culvert?	54 (8)	85 (7)	27 (7)		6 (6)	4 (4)	1 (1)	
C. U-FRAME								
1. Foundation type								713-G1-F505 713-R1-A3840 713-S8-K5180
a. Rock bearing	91 (15)	77 (12)	20 (16)		7 (7)	4 (4)	1 (1)	713-J2-M122
b. Earth bearing	122 (15)	136 (13)	36 (15)		8 (8)	4 (4)	1 (1)	713-C-P10
c. Pile foundation	22 (6)	34 (8)	18 (8)		2 (2)	2 (2)		013-R3-01
2. With interior culvert?	2 (2)	5 (4)	3 (3)					
3. Was soil structure interaction considered instead of simple active/passive Coulomb/Rankine formulas?	49 (4)	57 (5)	4 (4)		3 (3)	2 (2)	1 (1)	
D. Stilling Basins (Show Type)								
1. Anchored slab on rock	70 (19)	67 (18)	24 (20)		3 (3)	2 (2)		713-R3-A3500 713-R1-A3840 713-G1-F505
2. Pile foundation	11 (8)	11 (4)	13 (7)			1 (1)		713-J2-M1ss
3. Earth founded	63 (16)	64 (12)	28 (15)		4 (4)	1 (1)		
4. _____	4 (2)	4 (2)	3 (2)		1 (1)			
E. Trashracks								
1. Steel bar	149 (23)	25 (34)	46 (21)		1 (1)			
2. Steel grid	41 (10)	40 (10)	16 (7)					
3. Concrete	57 (14)	57 (11)	12 (12)		2	2		
4. _____								
F. Stoplogs								
1. Material								713-09-41040
a. Steel plate and beam/girder/truss	86 (19)	84 (22)	48 (17)		3			
b. Steel grid	7 (2)	9 (3)	11 (11)					
c. Concrete	8 (6)	12 (3)	4 (4)					

* Numbers in () indicate the number of Corps offices which provided data for the particular item.

(Sheet 1 of 6)

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
	Past	Future	Civil Works	Military			Attach a brief abstract if not in library	Give the name or number of the program if in the library
F. Stoplogs								
1. Material (Continued)								
d. Aluminum plate and beam	16 (5)	15 (3)	9 (4)		1			
e. Aluminum grid								
2. Type								
a. Horizontal span	104 (20)	105 (21)	15 (14)		2			
b. Poiree Dam	17 (6)	4 (3)	2 (2)		1			
G. Gates								
1. Tainter	90 (19)	41 (15)	34 (20)		10 (10)	7 (7)		713-G1-A3110
2. Miter	35 (12)	51 (11)	25 (15)		5 (5)	1 (1)		713-K2-H1103
3. Vertical lift	24 (5)	25 (5)	6 (6)		2 (2)	1 (1)		713-S8-K5300
a. Tractor	19 (6)	12 (5)	8 (8)					713-G9-A104
b. Slide	133 (17)	75 (16)	29 (19)		1 (1)			713-G9-A105
4. Sector	7 (4)	9 (4)	5 (4)		1 (1)			7-11-22010
5. Roller	59 (5)	26 (3)	9 (5)		1 (1)	1 (1)		
6. Wheel	23 (8)	29 (10)	8 (8)		1 (1)			
7. _____	28 (6)	46 (4)	6 (6)		1 (1)			
H. Bridges								
1. Loading								713-H1-34P
a. Highway	407 (34)	228 (23)	87 (27)	45 (16)	18 (18)	5 (5)		713-G1-C508
b. Railway	46 (19)	82 (17)	22 (21)	2 (2)	7 (7)	2 (2)		713-G1-G652
2. Material								713-K5-G3020
a. Concrete slab, steel beam-girders	148 (24)	120 (20)	42 (22)	44 (5)	11 (11)	1 (1)		713-R3-A3500
b. Concrete slab, pre-stressed concrete girders	85 (27)	66 (14)	35 (21)	3 (3)	7 (7)			713-K5-43020
c. Concrete slab, reinforced concrete girders	12 (7)	11 (6)	9 (8)					713-X6-2221
d. Concrete slab span	31 (6)	49 (8)	10 (8)	2 (2)				713-G2-22170
e. Timber	26 (7)	5 (1)	13 (6)	3 (3)				LS-0-41300
f. Orthotropic steel	2 (2)		1 (1)	1 (1)	1 (1)			713-G1-141
g. Nonorthotropic steel deck and girder	3 (2)	5 (2)		2 (2)				713-G1-F5130
h. _____	3 (1)	2 (1)	1 (1)	18 (3)	3 (2)			741-G1-53050
3. Action								713-24-150
a. Composite slab-girder	188 (26)	115 (22)	90 (23)	43 (4)	7 (7)	2 (2)		741-G1-F3060
b. Noncomposite slab-girder	33 (15)	35 (11)	14 (14)	10 (1)	3 (3)			
c. Box Beam	15 (4)	2 (2)	11 (5)		1 (1)			
4. Girder type								
a. Beam (including steel and concrete)	124 (23)	90 (20)	39 (17)	25 (6)	7 (7)	2 (2)		

(Sheet 2 of 6)

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
							Attach a brief abstract if not in library	Give the name or number of the program if in the library
	Past	Future	Civil Works	Military	(Place a mark in box if yes or attached)			
H. Bridges								
4. Girder type (Continued)								
b. Plate girder (show deck types in "Material")	77 (17)	95 (17)	16 (16)	20 (5)	10 (10)	2 (2)		
c. Truss (show deck types in "Material")	40 (9)	10 (5)	9 (9)		4 (4)	1 (1)		
5. Bridge piers	516 (25)	402 (23)	41 (25)	23 (4)	10 (10)	2 (2)		
6. Abutments	430 (24)	304 (31)	148 (23)	23 (4)	6 (6)	1 (1)		
I. Building Frames								
1. Analysis style								
a. 2-dimensional frames/trusses	714 (27)	772 (24)	92 (20)	245 (7)	25 (24)	2 (2)		713-G9-A104 713-G1-F501B 713-G1-F501C 713-S8-K530 713-G1-K616 713-F3-A1030 713-G2-L21 713-X6-L22 713-G1-F40A 713-G1-F40B 713-G1-F40C 713-G1-F40D 13K-G5-411
b. 3-dimensional frames/trusses	108 (11)	132 (13)	91 (8)	64 (5)	12 (12)			
2. Deck types								
a. Slab and beam (1-way or 2-way)	442 (21)	336 (19)	30 (9)	167 (8)	6 (6)			
b. Flat slab	112 (13)	111 (14)	9 (9)	35 (6)	3 (3)			
c. Fan-girder	81 (8)	187 (7)	4 (4)	23 (4)				
d. Other	284 (7)	112 (5)	6 (6)	3 (3)	2 (2)			
3. Design								
a. Steel frame, plastic design	84 (5)	118 (3)	3 (3)	180 (1)	2 (2)			
b. Ultimate strength, concrete	145 (14)	251 (13)	8(8)	88 (9)	6 (6)			
c. "	121 (10)	90 (8)	11 (6)	20 (1)	2 (2)			
J. Building Foundations								
1. Isolated spot footings	1551 (21)	1604 (16)	31 (15)	2197 (9)	3 (3)	1 (1)		
2. Drilled piers/underream	113 (14)	100 (10)	11 (8)	60 (8)	3 (3)			
3. Ribbed mat slabs								
a. Conventional	82 (9)	80 (7)	19 (7)	3 (3)				
b. Beam on elastic foundation	127 (5)	130 (4)	5 (4)	2 (2)	3 (3)		1 (1)	
K. Flat Plate Systems								
1. Edge restraints								713-X6-L22
a. Fixed	50 (9)	47 (8)	7 (7)	3 (3)	1 (1)			
b. Pinned	17 (4)	19 (4)	4 (4)	2 (2)	1 (1)			
c. Free	25 (5)	24 (5)	4 (4)	3 (3)	2 (2)			
d. Mixed restraint	81 (11)	55 (11)	25 (9)	5 (5)	3 (3)			
e. "	20 (2)	30 (2)		1 (1)	1 (1)			

(Sheet 3 of 6)

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
			Civil Works	Military			Attach a brief abstract if not in library	Give the name or number of the program if in the library
	Past	Future						
L. Reinforced Retaining Walls						(Place a mark in box if yes or attached)		
1. General type								
a. I (cantilever)	422 (26)	227 (20)	127 (24)	16 (7)	11 (11)	5 (5)	1 (1)	
b. I (tied-back)								
1. Single	49 (9)	43 (7)	32 (9)	4 (4)	2 (2)	2 (2)	1 (1)	
2. Double	8 (6)	4 (2)	5 (3)	1				
c. Inverted-T	290 (17)	259 (18)	20 (19)	1	18 (9)	5 (5)		
d. Semi-gravity	31 (6)	39 (7)	9 (9)	2				
2. Stem type								
a. Cantilever	242 (30)	242 (20)	36 (24)	16 (5)	8 (7)	5 (5)		
b. Buttress	2 (1)	2 (1)	2 (2)					
c. Counterfort	16 (3)	18 (3)	2 (2)					
3. Foundation type								
a. Rock	124 (23)	18 (18)	25 (11)	8 (4)	6 (6)	4 (4)		
b. Earth bearing	229 (26)	195 (17)	23 (13)	16 (7)	16 (7)	4 (4)		
c. Piles (see question #R1)	42 (11)	43 (10)	14 (12)	3 (3)	1	1 (1)		
M. Reinforced Flood Walls								713-F7-C1070 713-G1-A307 713-G1-F5010 713-G1-F5060 713-G1-M306
1. General type								
a. I cantilever	227 (12)	212 (9)	124 (12)		5 (5)	1 (1)		
b. Inverted-T	214 (14)	211 (8)	138 (15)		4 (4)	2 (2)		
c. Semi-gravity	1 (1)	1 (1)	2 (2)					
2. Stem type								
a. Cantilever	320 (17)	312 (9)	18 (13)		6 (6)	3 (3)		
b. Buttress	4 (1)		1					
c. Counterfort	3 (1)	3 (1)						
3. Foundation type								
a. Rock	48 (8)	52 (5)	46 (7)		2 (2)	1 (1)		
b. Earth bearing	144 (15)	125 (9)	29 (15)		6 (6)	2 (2)		
c. Piles	160 (6)	173 (4)	87 (6)		1 (1)	1 (1)		
4. Loading type								
a. River/reservoir	222 (15)	214 (10)	217 (14)		4 (4)	2 (2)		
b. Hurricane	127 (3)	116 (4)	22 (3)		1 (1)	1 (1)		
N. Sheet Pile Structures								
1. Cellular walls								
a. On rock	58 (18)	52 (15)	26 (19)		3 (3)	2 (2)	1 (1)	
b. On sand	72 (12)	40 (8)	21 (13)		2 (2)	1 (1)		
c. On clay	21 (4)	26 (8)	4 (4)		1 (1)			
2. _____	161 (6)	202 (6)	16 (7)	1 (1)	2 (2)			
O. Crib Walls	30 (10)	24 (6)	11 (11)	1 (1)	1 (1)			
P. Conduits (Cut and Cover)								713-C2-0039 713-X6-L221 713-C2-0029 713-X6-L224
1. Box, single or multiple	163 (24)	182 (25)	91 (29)	5 (2)	12 (12)	6 (6)	1 (1)	
2. Circular	51 (14)	52 (12)	19 (15)		5 (5)	4 (4)		
3. Oblong	33 (12)	21 (6)	12 (12)		6 (6)	5 (5)		

(Sheet 4 of 6)

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
			Civil Works	Military			Attach a brief abstract if not in library	Give the name or number of the program if in the library
	Past	Future						
Q. Tunnels						(Place a mark in box if yes or attached)		
1. Horseshoe	10 (4)	10 (4)	9 (5)		2 (2)			
2. Inverted-U	3 (2)	4 (2)	2 (2)		5 (5)			
3. Circular	30 (13)	25 (11)	18 (14)		5 (5)	4 (4)		
R. Pile Foundations, General								713-G1-F5160 713-F3-A2150 713-F3-A2210 713-S8-K528 713-R1-A3840
1. "Hrennikoff" soil-structure interaction								
a. 2-dimensional	137 (13)	153 (15)	32 (12)		7 (7)			
b. 3-dimensional	31 (7)	124 (6)	22 (8)		6 (6)			
2. Elastic center/analysis	117 (9)	117 (9)	146 (8)	5 (1)				
3. Finite element (continuum) approach		3 (2)	1 (1)		1 (1)			
4. _____								
S. Lock Approach Guide Walls								
1. T	3 (1)		1					
2. Gravity	23 (6)	55 (7)	27 (7)		3 (3)			
3. Floating	4 (3)	17 (2)	5 (4)					
4. A-frame, no backfill	4 (2)	3 (2)	4 (4)					
5. _____	16 (5)	16 (3)	3 (3)					
6. _____			1 (1)					
T. Outlet Works and Intake Towers-- Various Types								
1. Circular	48 (17)	35 (12)	9 (9)		4 (4)	3 (3)		
2. Box	48 (13)	54 (10)	23 (14)		4 (4)	4 (4)		
3. Multi-well	40 (11)	41 (12)	17 (13)		4 (4)	3 (3)		
4. _____	2 (2)	2 (1)	3 (3)		2 (2)			
5. _____	3 (3)		3 (3)		2 (2)	2 (2)		
U. Other Structures-- List any other MAJOR structure not included in this list that you may have designed or will design in the future. Include, also, military structures such as barracks, BOQ's, hospitals, schools, repair shops, etc.								
1. _____	188 (16)	152 (15)	25 (11)	7 (7)	5 (5)			
2. _____	128 (9)	110 (10)	13 (5)	7 (7)	1 (1)			
3. _____	92 (6)	85 (6)	8 (2)	7 (7)				
4. _____	44 (7)	35 (2)	8 (3)	5 (5)				
5. _____	39 (6)	42 (4)	5 (2)	3 (3)	2 (2)			
6. _____	5 (1)	4 (2)	1 (1)	1 (1)				
7. _____	5 (1)	3 (1)		1 (1)				

(Sheet 5 of 6)

Type of Structure	How many such structures has your office designed/will design?		Used in		Was a computer program used?	Was it an unpublished local program developed in your office?	Optional	
			Civil	Military			Attach a brief abstract if not in library	Give the name or number of the program if in the library
	Past	Future	Works					
V. Special Purpose Structures						(Place a mark in box if yes or attached)		
1. Transmission towers	25 (7)	15 (3)	10 (5)	2 (2)	5 (5)			
2. Water tanks	55 (13)	36 (7)	5 (5)	4 (4)				
3. Blast containment structures								
a. Igloos	23 (3)	20 (2)		3 (3)	1 (1)			
b. Other	39 (5)	21 (21)		5 (5)	1 (1)	1 (1)		
4. Hydro Power Plants	20 (6)	15 (5)	8 (8)		4 (4)	1 (1)		
5. _____	28 (7)	16 (6)	10 (8)	1 (1)	6 (6)	4 (4)		

(Sheet 6 of 6)

APPENDIX G: TENTATIVE RECOMMENDATIONS OF THE DIVISION SPEAKERS

On the final day of the CADSE Conference, the speakers who gave presentations on their Division's activities in CADSE made tentative recommendations to improve CADSE in the Corps. These recommendations are included in this appendix. A summary of these recommendations is included in the main text in Part VL. The final recommendations of the Divisions are contained in the Division papers which are planned to be published as a separate volume.

Huntsville Division

1. The Corps needs to have a large efficient computer on the order of the CDC 7600.
2. The Corps needs to assemble all of the various operational programs in one central system, for example in CORPS or FACTS.
3. The Corps needs to establish a permanent ad hoc committee to study all available programs and recommend the ones which are most efficient (i.e., cost effective.)
4. OCE should sponsor user group seminars especially for programs such as NASTRAN, ANSYS, etc.
5. By all means let's continue to have meetings such as this so that our ideas and opinions can be made known.
6. A committee should be appointed out of this Conference to help condense, explain, justify, and implement the recommendations of this meeting.
7. More in-house structural analysis and design is recommended to better utilize the resourceful engineers within the Corps.
8. Possibly for all widely used computer programs, and particularly for finite element programs, a certain class of programs should be recommended to meet the needs of engineers in structural analysis and design. Further, that class of programs should be maintained and updated by specialists in programming and the related field--with time and money allocated to serve that specific purpose.

Lower Mississippi Valley Division

Based on our experiences the LMVD recommends that appropriate

action be taken to resolve the following difficulties:

1. Hardware. Existing policies and regulations regarding acquisition of computer equipment require 2-3 years minimum for the procurement process, and result in obtaining equipment which is approaching obsolescence. This situation is not expected to improve until higher echelons of authority revise formal regulations regarding computer procurement, and adopt more flexible and realistic policies concerning the scope and importance of computer usage by engineers in the Corps. Until this problem is resolved, it will be necessary for our offices to supplement the services available from WES with those of McAuto Corporation, or equal.
2. Documentation. This office recommends that additional action be taken to insure that the programs available in the ECPL are well documented. Some mechanism should be established within the Corps to fund a full-time staff for this purpose.
3. Software. We consider the concept of the LMVD CASD Committee to be applicable to most Corps offices. Consideration should be given to combining several offices, with similar interests, into regional CASD groups and coordinating the overall effort in OCE.

Methods of monitoring progress, recognizing problems, and accounting for actual costs should be established in each District without stifling the engineer's initiative to seek more realistic and economical solutions.

Each project engineer should be responsible for evaluating the use of computer-aided design techniques for his current and future workload. This evaluation should be reviewed by his supervisor and should include:

- a. Possible uses of the computer.
- b. Are the required programs available?
- c. Who will develop the required programs? (ADP, structural engineers, CASD Committee, etc.)
- d. When must these programs be available?
- e. Can these programs be used in the immediate future for other projects?
- f. A progress chart should be prepared which identifies the major divisions of work, the time scheduled for each task, etc. This chart will be an aid for planning and reporting progress.
- g. Can temporary employees (coop or summer students, etc.) be used to document the program?
- h. The progress charts for successful and unsuccessful programming attempts should be filed for future reference.

To fully implement a plan for computer-aided design it will be necessary to have a staff of specialists in the Engineering Division. These specialists are necessary because ADP centers do not provide personnel to do engineering programming.

There are relative advantages and disadvantages to having this staff of specialists assigned to a central branch in the Engineering Division (i.e., similar to the Systems and Programming Branch in the New Orleans District), or assigned to each element. This is a matter of individual preference to a large degree. The key factor which our offices must recognize is that computer-aided design requires full-time support which is not available in our ADP Centers.

Districts with a large staff of structural engineers should consider allocating three members of the Structures Section to computer-aided design techniques. This unit would be responsible for providing expert advice to design engineers on computer-aided structural engineering, developing special purpose computer programs, and training other engineers and technicians.

This unit should consist of:

- a. GS-12 Senior Structural Engineer. A permanent assignment with responsibility for coordinating all computer-aided structural design tasks. This person must provide expertise and leadership in the techniques of computer-aided structural engineering.
- b. GS-7/11 Structural Engineer. Numerous engineers could be rotated into this position to gain experience and confidence in the use of computers.
- c. GS-5/7 Engineering Technician. This person would be familiar with and perform data preparation, computer systems operation, and FORTRAN coding. Numerous technicians could also be rotated into this position.
- d. Temporary Employees. This staff could be supplemented by temporary coop or summer employees.

It should be emphasized that this unit of specialists would not only provide a source of expertise and leadership, but an orderly, effective means of providing on-the-job training. As previously stated, the present state of computer-aided design in the Corps is chaotic, and our chief resource is the quality of our personnel. Proper training

is therefore essential to maintain and improve our current level of expertise.

Missouri River Division

Recommend that OCE direct the selection and maintenance of existing programs or the writing of new programs to solve structural design and analysis problems. The organizations selected by OCE to perform the work would be funded for this work. The work would consist of programs, program documentation, and user manuals. In the more sophisticated applications the developers would also be prepared to provide training to potential users on the reimbursable basis. OCE would make field offices aware of these "recommended" programs through the engineering manuals or other engineering information channels.

Before assigning a particular program area for this effort, OCE should project the possible Corps-wide use over the next 5-10 years based upon projected Corps-wide workload. A 5- to 10-year usage benefit should then be estimated and compared to an estimated development and maintenance cost to determine the priorities for assigning the various structural areas. The workload should be based upon this analysis rather than the interest or availability of the organizations selected to do the work.

New England Division

1. Funds must be provided on a Corps-wide basis allocated by Divisions, similar to R&D funding. Reasonable guideline is 10 percent of Design Sections annual cost.
2. Because of present WES limitations to support all functional users, they should consider making all the library available on some other system such as CSC INFONET so that all can access it.
3. We would like to see a consolidated list of what all field users are engaged in and what systems they are presently using so others can be consulted as to problems that we may run into. Computer "NOTES" provides this to a degree but needs improvement.
4. OCE should justify any proposed requirements where many Districts and Divisions show interest other than individual justification.

5. Corps programs should consider the environment and the three-dimension to a greater degree than they presently are. Soil structure interaction is a necessary program function if an attempt at developing universal programs for Corps-wide usage is to be successful.
6. OCE should provide a centralized information center to inform Corps users of now in-house systems, any problems that may be encountered in changing from one system to another when requested, or what the advantages or disadvantages of using a particular system or company may be.
7. Only Category "A" programs should be accepted by the WES library. All programs "must" be capable of Corps-wide usage with regard to technical accuracy and user documentation. Programs that are not, or if a slipshod attitude is taken in accepting programs at WES, will result in a loss of time, money, and degradation of the library in general. It may also result in people refusing to use the library because of lack of confidence in programs or in the people who manage the system.
8. OCE should recommend what programs, particularly in the design area, will be acceptable to them thus enabling those not familiar with these programs to have more confidence in them and use them.
9. There is a tremendous duplication of effort. This must be curtailed. More communication between Corps Divisions and Districts will, I feel, resolve this considerably.
10. There appears to be a wide ranging difference of opinion in many areas with regard to design criteria and procedures. OCE must through their EM's clear this up and give some guidance on the proper mode to follow. Without this, programs for Corps-wide use will never be developed since everyone will still have their own beliefs on design procedures and will refuse to use a program that does not advocate their beliefs.
11. Corps offices should be kept aware of new techniques and advances in their fields so as to stay abreast with the state of the art.
12. The idea that finite element techniques are a "design" rather than an "analysis" tool must be cleared up once and for all. It should also be stated that while finite elements are a unique tool it is not all-encompassing and should only be used with discretion when other methods, that may be easier to use, fail to give acceptable results.
13. It would have been nice if we discussed computers or the role of computers in our analysis or design techniques in the "Speciality" sessions more. Many moderators thought a quick course on design was what we needed, not their opinions on how computers could or could not help us. More work needs to be done to determine which programs are viable from an unbiased viewpoint. Speciality sessions need a lot of improvement. Discussion must be stimulated in a positive way.

Theory did not really have to be discussed to the extent it was. Hopefully the final reports will have more to say. Gravity Monoliths and U-Frame Section was good.

North Atlantic Division

1. Programs with Corps-wide application should be developed and maintained at a specific location. Funding should be furnished by OCE separate from the Military Construction or Civil Works Project appropriation and it should include funds for dissemination of information and some training.
2. Appendixes should be issued to engineering manuals, with listing and evaluation of available programs for design of the subject structures.
3. Future conferences of this type (perhaps more limited in scope, covering different subjects in alternate years) should be held. Perhaps the Division presentations should be limited in future conferences and more time devoted to computer application. Prior review of papers to be presented would encourage better participation by participants.

North Central Division

1. OCE-sponsored development and verification of Corps-wide programs.
2. Incorporation of OCE-sanctioned programs into appropriate EM's.
3. Establishment of a centralized location for user information.
4. Development of user manuals.
5. Centralized maintenance of all accepted programs.
6. Periodic Division-wide and Corps-wide seminars.

North Pacific Division

1. Funding from OCE should be provided to develop and maintain an engineering program library.
2. It would appear that WES should be the arm of the Corps to develop and maintain the library.
3. OCE should not direct or control the use of the program.
4. User manuals should be written so anyone, after reading the manual, can use the program for simple (equation solver) moderate (matrix solver) programs within one-hour usage and not over one-half day for complex (frame) programs.
5. WES should assemble all programs on each subject. Rewrite, modify, etc., the programs on each type of major problem into a single program (on each item).
6. We need interactive systems, graphics to simplify the use of the machine.

7. The type of program we are looking for should have the following:
 - a. Fast turnaround.
 - b. Small load module.
 - c. Free formatted interactively run.
 - d. Flexible STRUDL type loading input plane frame analysis program.
8. Less emphasis on giant programs, concentrate on maximizing user.
9. Strengthen ADP support to engineering division; engineering divisions have a set up similar to LMVD.
10. Provide hardware for map use of/by engineering division: a system that can be used in office (small programs) and programs that exceed office machine capability should tie in and be solved by a larger computer in Division offices or at WES.
11. Need graphics for input/output on our machine (IBM 360).
12. Better avenues of communication from and to Districts, Divisions, WES, and OCE.
13. More basic courses to simplify use of machine, user education.

Ohio River Division

1. Update programs to current doces (concrete and steel).
2. Take similar programs and develop one general purpose program.
3. Produce an up-to-date list of all programs available within the Corps.

South Atlantic Division

In view of the many actual and potential advantages in the use of computers in structural engineering, a concerted effort should be made at every echelon within the Corps to encourage its utilization to the optimum extent, especially management. To minimize duplication of effort, some control measures are also needed; however, these control measures should be of a nature that will tend to encourage rather than discourage the expended use of computers. To be most effective in minimizing duplication of effort the control and coordination should be centralized and applied on a Corps-wide basis. It is recommended that OCE, through the WES library, make a survey of programs currently available

within the Corps or commercially. These programs should be reviewed giving due consideration to such factors as design assumptions, Corps criteria, design codes, and standardization of design. Where duplication exists a determination should be made as to which programs are better, then appropriate programs should be catalogued and thoroughly documented. WES should also monitor the development of new programs during development to limit future duplication of effort. It is realized that implementation of these recommendations would require funding. It appears that it would be appropriate for OCE to fund the development of computer programs which have broad application similar to OCE funding of R&D.

Southwestern Division

1. It is great to be able to talk with other District and Division representatives on problems of mutual interest.
2. It has broadened our view of available Corps programs.
3. It has given us some insight on computer graphics and applicable uses.
4. Latest information on CORPS and FACTS was obtained.
5. It is difficult to learn of other Division problems without a meeting such as this.
6. I think this meeting will lead to more cooperation between Districts and Divisions.

Supervisor's Remarks (Mr. Rich Armstrong, Chief, Technical Engineering Branch, LMVD).

As far as I am concerned, this Conference has been an outstanding success. I would like to compliment Dr. Radhakrishnan and others who worked so hard to put this Conference together.

The goal of a supervisor is to get the job accomplished in a

- a. Soundly engineered manner.
- b. A reasonable cost.
- c. On schedule. The on-schedule part of this goal is what usually gives us problems. Sometimes the structural design is what causes the completion of the job to be after the scheduled date.

From the Supervisor's Point of View

This seminar has been an excellent vehicle for distributing information on computer programs and hardware to help the structural engineer in the Corps. I have learned of several programs which I think can be used to advantage in several of the Districts in LMVD. I am particularly interested in the new computer graphics applications which were exhibited here.

As a supervisor, I am concerned with maintaining our in-house capability as experts on design of flood control and navigation structures. In the past few years we have found it necessary to contract out more and more of our designs in order to meet the scheduled completion dates. If this trend continues, one day in the not too distant future so much of our work will be accomplished by others that we will lose all expertise that we had gained over the years in the design of hydraulic structures. We will then, in fact be the "Corps of Clerks" as mentioned by one of the speakers earlier this week. So it seems to me that it is necessary for the very survival of structural engineers to find a more efficient and faster way to accomplish our designs. The expanded use of computer programs for design and analysis may be the best way of accomplishing work in house at a more rapid pace. It may be possible to accomplish most of our design of computers and contract out the preparation of plans and specs. This should be considered by the District supervisors.

Usually the structural engineer does not have time to write a program at the beginning of each job. He usually does not even have time to modify someone else's program to fit his need. I know of many supervisors who are somewhat cool toward use of programs because of the time that has generally been required to develop confidence in a program. The only solution that I know of to this problem is to educate the supervisor on the successful designs that have been accomplished by the computer.

Therefore my thoughts on future actions in the area of computer-aided structural design are as follows:

- a. This Conference be repeated at least once each 2 years in order to disseminate information in the latest advances in software and hardware that can be used by structural engineers in the Corps.
- b. Either OCE or Division-wide panels of structural engineers be established to determine which programs are needed by structural engineers, whether they are available, and if not to whom to assign to develop these programs. The cost can be funded on a prorated basis from District funds. We are already doing this in LMVD on Division-wide basis.
- c. Each District consider establishing a structural computer group to be the experts on use of programs for structural design in that District. The group should consist of two or three engineers, and they should be on a rotational basis. Computer programs can usually be used in a timely fashion only if the user is familiar with the programs.
- d. Each District and Division should look ahead several years to determine what type of work will be accomplished in the next 5 years and what programs are available and take the necessary action to have these programs developed either in house, or at one of the Corps service agencies such as WES or CERL.
- e. Greater use be made of computer software and hardware available in private industry. Some of the general purpose programs offered by private computer time-sharing companies appear to be at least as good or maybe even better than ours. The maintenance of the privately owned programs appears to be better than maintenance in the Corps.

In summary, we can accomplish our goal by soundly engineered designs at a reasonable cost and in a timely manner best by all working together and helping each other in development and use of computer-aided design for structural engineering problems.

APPENDIX H: TENTATIVE RECOMMENDATIONS OF THE MODERATORS

On the final day of the CADSE Conference, the Moderators of the speciality sessions gave tentative recommendations that resulted from their respective sessions. These recommendations are included in this appendix. The final conclusions and recommendations are contained in the Moderators' SØCA papers which are planned to be published as separate volumes.

Session A: Gravity Monoliths, U-Frame (Locks and Channels)

Gravity Monoliths

1. Some programs for nonoverflow structures, spillway, lock walls, and stress investigations currently exist in the Corps. However, all these programs have some deficiencies and need improvement.
2. An ideal program should include automatic application of load combinations required by the appropriate EM's minimum input, 3-D loading and resultants, optimization capability, and interval stress investigation. This is not beyond the reach of current technology.

U-Frame Locks

1. The original U-Frame code must be used with caution.
2. The MODIFIED U-FRAME code, while not considering cracking in concrete, is perhaps the best analytical tool available.
3. Existing codes should be modified to consider the effects of cracking in reinforced concrete and possibly to include 3-D effects.
4. Pre-processor programs can ease the engineer in generating grids for the finite element programs.
5. Instrumentation on new locks is recommended along with finite element analyses to increase the confidence of designers in the analysis tool.

U-Frame Channels

1. At least nine different programs exist for designing U-Frame Channels; five have been evaluated in the report.
2. Use of computer programs may be more economical and produce more refined designs than using desk calculators.
3. All programs need improvement and documentation.

Session B: Gates, Stoplogs, and Trashracks

1. For Stoplogs there are no existing programs written specifically for either the truss- or plate-girder-type stoplogs. We recommend that the Corps develop a standard program for both types of logs.

2. For Wheel and Roller Gates there are no existing programs. The need is probably not great enough to justify the cost of writing and maintaining a program especially for wheel or roller gates. The same is true for Trashracks.

3. For Tainter Gates several good programs are available in SWD, NCD, WES, and other locations. These existing programs should be reviewed in detail. The minimum number of separate programs necessary to cover all conditions should be adapted for Corps-wide use.

4. For Miter Gate design we recommend the Mobile District program because it yields a more complete design than the one other existing program. The Mobile people would like to extend the program to include the design of diagonals if funds can be made available.

We feel that this conference has been successful in the exchange of information on existing computer programs and in the determination of future needs.

Session C: Single- and Multiple-Cell Conduits, Tunnels

1. Tunnels--Use WES Program for steel sets. TVA suggests the Bureau of Mines as a source.

2. Single-Cell Conduits--Rewrite the existing program unless the Kansas City program is adequate. Forward it to OCE for Category "A" and require timesharing.

3. Multiple-Cell Conduit--General purpose McAuto STRUDL, special purpose Albuquerque - Jack Miller M1070.

Recommend WES develop a design routine using the Corps working stress manual for general purpose programs.

Session D: Pile Foundations, Sheet Pile Cells

1. Pile Foundations. It is recommended that two programs, one for rigid base structure (713-F3-A3840) and the other for flexible base structures (SAPPILE) both 3-D analysis--be standardized for Corps-wide use. These programs are satisfactory, subject to consideration of modification to enable them to evaluate foundations subject to dynamic loads research and updating of documentation.

2. Sheet Pile Cells. The Corps presently has three programs available which should satisfy our needs. Each performs different functions, i.e., analysis of cells founded on rock (713-23-190), analysis of cells founded on soil (13J8F105), and deep-seated sliding stability (713-24-300). It is therefore recommended that all three programs, subject to some slight modification in order to obtain greater flexibility with respect to certain assumptions and conditions of loading and better documentation, be retained.

3. General. It is also recommended that EM's include a list of approved, properly documented programs relating to the EM's particular

subject. These should be included as an appendix and the individual designer could use the program or not use it as he sees fit.

Comments:

1. The speciality sessions were not long enough. This was unfair both to the moderators, who did not have time to fully develop their subject and to the participants as there was insufficient time for proper discussion. Too large.
2. The discussions tended to dwell more on design theories, methods, and philosophies rather than on the availability of, or need for, programs.

Session E: Sheet Pile Walls, T-Walls

General

1. Standard computer programs should be adopted Corps-wide for design of such walls. This would be accepted by higher authority, and designs made using the programs properly would be approved without elaborate submittals.
2. The standardization should be obtained by a task force similar to the LMVD CASD committee.
3. Special programs should be developed rather than general purpose programs.
4. All standard programs should be conversational or interactive with the user.
5. Interactive graphics should be included in the interaction.
6. Some Districts feel that District programs should be used rather than overall programs (this was a minority view).

Sheet Pile Walls

1. Existing programs using active-passive pressure methods are available that could be made the standard with some modifications.
2. A standard program should be developed for flexible earth support using either finite difference or finite element methods.
3. Existing Corps criteria are too conservative. Criteria should be modified to agree with existing state of the art.

T-Walls

1. There are numerous existing programs currently in use.
2. Before standardization is possible the differences in design criteria must be resolved.
3. As an aid in resolving differences in criteria a finite element program may give some indication which criteria are applicable.

Session F: Bridges, Frames, Military Construction

1. There is a wide variety of acceptable building frame programs available--we feel that the better ones are:
 - a. Wilson 2-D.
 - b. ETABS (for 3-D structures).
 - c. SAPIV.
 - d. STRUDL (for analysis and design).
2. If a designer is familiar with a particular program and is comfortable using it, he should continue to use it.
3. Interactive graphics routines must be provided to simplify input and display output.
4. Programs that have the interactive graphics capability will become favored by engineers and their use should be encouraged.
5. The computer should be more broadly applied to the design process in military construction, not just during the detailed technical design stage.
6. Computer software that examines a variety of alternate design assumptions and provides output that the designer can use to effectively optimize the design choice is needed.
7. In the MC design work, not enough really challenging design work is done in house. The result is that the in-house design and review expertise is deteriorating.

Session G: Earthquake and Dynamic Analysis

1. Mr. Dembo's summary of his paper concerning military structures included the limitations of the equivalent lateral static force methodology contained in TM 5-809-10, "Seismic Design for Buildings," the response spectrum and finite element time-history methods of dynamic analysis, computer programs for dynamic analysis, seismicity in the eastern United States, and nuclear weapons effects.
2. Mr. Guthrie's summary of his paper concerning hydraulic structures included the present seismic coefficient method of analysis, the response spectrum and finite element time-history methods of dynamic analysis, earthquake engineering research, instrumentation, and training courses, and computer programs for dynamic analysis.
3. During the discussions which followed, the following points were made:
 - a. In order to use the finite element method (FEM) efficiently, preprocessors and postprocessors for handling the input and output data are a must.
 - b. A significant improvement in the latest finite element general purpose structural analysis computer program SAPIV could be

made, possibly, by including in SAPIV the preprocessing and postprocessing capabilities of the earlier developed general purpose structural analysis computer program GENSAP.

- c. A computer system with a capability of that of the CDC 7600 is greatly needed for dynamic analysis computer programs.
- d. Before a finite element computer program is used by a District for structural analysis, the engineers using the program need to be knowledgeable of the finite element theory and well trained in the use of the computer program. The formation of a group of several engineers within a District who specialize in the use of computer programs deserves consideration.
- e. Guidance on the dynamic material properties of mass concrete is needed now for evaluating the results of dynamic finite element analyses of dams and appurtenant structures.
- f. Guidance on the selection of design earthquake is needed now for use in the response spectrum or finite element dynamic analysis methods. Two sources of guidance were mentioned. They are the progress report "Seismic Risk Analysis, California State Water Project" by Professor Haresh C. Shah of Stanford University given 30 January 1975 at the California Water and Power Earthquake Engineering Forum, and the Construction Engineering Research Laboratory Technical Report M-114, "Guidelines for Developing Design Earthquake Response Spectra," June 1975.
- g. The seismic resistance of hydraulic gates, such as tainter gates and miter gates, should possibly be investigated by dynamic analysis methods.
- h. It is very important that a substantial part of the Corps design work be done in house in order to maintain the Corps design capability.
- i. TVA has had considerable experience in the seismic design of nuclear power plants by the response spectrum method.
- j. The Structural Design Language (STRUDL) computer program may be used for the dynamic analysis of the simpler framed structures instead of GENSAP. STRUDL is easier to use.

APPENDIX I: PARTICIPANTS' EVALUATION OF CADSE

Summaries of Responses to Questionnaires

At the conclusion of the CADSE conference, each participant was asked to complete a questionnaire, indicating his views on CADSE and the Corps computer-related problems. Their responses were transcribed into a computer data base from which summaries were obtained. Two of these summaries are included in this appendix. The first, Figure 11 presents a numerical and graphical summary, while the second, Table 11 gives a more detailed analysis of the responses.

There are several points regarding the questionnaire and the summaries that should be considered in order to place the responses in proper perspective. These points are covered in the following paragraphs.

The Questionnaire, Format

The major portion of the questionnaire consists of statements about subjects related to CADSE. To each of these statements the evaluator indicated his views or reactions by marking one of the following.

- a. SA indicating strong agreement.
- b. A indicating agreement.
- c. R indicating reservation, no strong feeling, indifference, etc.
- d. D indicating disagreement.
- e. SD indicating strong disagreement.

Also included were a few statements where the participant might select the one(s) that he felt was correct.

Participants' Responses

Varied responses

There are several shortcomings in this questionnaire. Some of them influence the results shown in the summary because not all

participants completed the questionnaire in the same way. The differences are discussed in the following paragraphs.

Multiple votes

Statements were made on the topic of minicomputers versus large computers. Some participants responded to every one of those statements while others responded to only one.

No votes

Some participants did not use the R option of some statements. This may have been done by participants who did not think themselves qualified to comment on a statement. For example, a person whose background was in computer science might not want to comment on whether SAP was a useful program for design purposes.

No votes also developed when the participant interpreted the statements to mean "choose one of the following" instead of "answer every one." Finally, some statements only offered the option to choose one (or more); i.e., there was no provision for stating the degree of agreement. In the summaries, those statements which were marked are shown as strong agreement. The unmarked statements are shown as no vote.

Signatures

The questionnaire contained a block for the participant's signature along with a statement that the signature was optional. Almost 75 percent of the evaluators signed their questionnaire. The organizers further classified those signed questionnaires as to engineer/ADP position and supervisor/nonsupervisor in order to provide data for the detailed analysis.

Overall Summary

Content

The overall summary (Figure 11) provides an easy way to take a quick look at the responses to each statement. It gives the statement (in some cases shortened to fit into lines), the percentage responding to each of the five opinion levels (strongly agree, agree, etc.), plus

the percentage that did not respond to the statement (NO VOTE).

Calculations and format

The percentages were calculated by dividing the number of responses to each level by the total number of questionnaires (150) that were filled out. There was no attempt to bias the calculated values to make the sum of the percentages in all six levels equal to 100 percent. The values will sum to 99.9, 100.0, or 100.1, all of which should be interpreted as 100 percent.

In addition to the calculated values, a bar graph of percentage is provided in the form of a row of stars (*) to the right of an initial colon. The colon marks the zero reference. Each star represents a change of 2.5 percent. Thus a row containing ten stars represents a percentage value between 23.75 percent and 26.25 percent. This degree of precision is more than adequate for this analysis since ranges below 5 percent represent the views of less than eight people. Such small samples are of highly questionable value.

Interpretation

The purpose of the bar graphs is to give an easy-to-grasp picture of the distribution of the views. From these bar graphs one can quickly identify the following conditions.

- a. Strong bias for the statement indicated by long rows of stars only in the upper part of the graph.
- b. Strong bias against the statement indicated by long rows of stars only in the disagree-strongly and disagree (lower) portion of the graph.
- c. Strong polarization of views indicated by long rows of stars in both the upper and lower portions of the graph and few stars in the no preference row.
- d. Lack of strong feeling or lack of sufficient information as indicated by concentration in the no vote row should not be interpreted as lack of strong feeling. The reasons discussed in earlier paragraphs are the likely causes of large numbers of NO VOTE responses.

Further analysis

Since the responses are stored in a computer data base, it is quite easy to use the existing analysis programs to present other information. For example, a bar-type plot of the views of supervisory

engineers might be compared with a similar plot of the nonsupervisory engineers. Details on developing such plots can be obtained from the authors.

Detailed Summary

Content

The detailed summary provides a breakdown by number of responses and percentages and how supervisors (SUPERVI) and nonsupervisors (NON-SUP) responded. Further, it shows how engineers (ENG) and ADP people responded. It also shows how the signed and unsigned (NO NAME) responses compare. Finally, it gives the overall responses to each statement.

Format

The first line of each summary begins "STATEMENT (nn):" where nn is a number assigned to the statement for reference purpose in this report. The number did not appear in the original questionnaire. Following the colon, is a two-line statement that duplicates the one in the questionnaire, except for the few cases where it was shortened to fit into two lines. The next line sets out the heading for the first analysis "SUPERVI" (supervisors), and follows with the column headings for the five levels of opinion, and the NO VOTE column.

Following the heading line is the first set of computed results. These results are labeled ADP. This indicates that the responses and computed values are for supervisory ADP people. The entry in each column has the form: vvv/pp.p% where vvv represents the number of people who responded and pp.p represents the percentage. The percentage is calculated by dividing the total number of responses on the line into the individual responses for each level of opinion. Thus the sum of the percentages on each line is 100 percent. This enables the analyst to see how, for example, the views of supervisory engineers were distributed.

The entries on the next line titled "ENG" are for supervisory engineers. The next line titled "TOTAL" is the combined rating of engineering and ADP supervisors showing the views of supervisors as a whole.

The next line titled "NON-SUP" is followed by three-line breakdown like that previously described, but this time the results are for nonsupervisory people.

The next two lines give the responses of the participants who signed their questionnaires, titled "SIGNED," and those who did not, titled "NO NAME." The final line gives the overall responses of all who filled out a questionnaire.

Value and limitations

The results of the percentage calculations are shown to the nearest one tenth of 1 percent. However, the analyst should not infer that the statistical significance of the results is anywhere near the value. A value of 10 percent is probably near the lower limit of confidence.

Note also the sample size is quite small in some classes. For example, only six supervisory ADP people were identified in this survey. With such small sample sizes only very high percentages of agreement can be considered representative.

No effort has been made to compare the signed views with those given in the unsigned responses. Whether the nonsigners represent the "unhappy people" or just do not sign questionnaires is an interesting question to ponder.

The Evaluation in Retrospect, A Post Mortem

Last minute effort

In preparing for any event, some things must be put off until the last minute; some things are afterthoughts. This survey was such an event. In retrospect it could have been more useful had further attention been given to it. For instance, a check-mark box to indicate supervisory and engineering people would have greatly improved the usefulness of data. The instructions and statements needed to be clearer and more precise. Also useful would be a breakdown based on years of service with the Corps. The list of things one might have done seems to get longer as one examines what was done.

In summary, this was a very important event. It produced some

surprising, interesting, and useful results. It shows what can be done and equally important what should not be done in such a survey.

Recommendations

In planning for future conferences the makeup of the survey should get early and high priority attention. Input (statements) should be solicited from as broad an interest base as possible. The planners should consider getting help from professional opinion surveyors to aid in formulating statements, developing cross checks, and evaluating the results. A small detail like using a word-processing system (as was done for this questionnaire) may help by allowing last minute changes, additions, and deletions.

In short, getting the most out of a survey takes time and thought. It also requires a degree of special skill which, if necessary, should be borrowed from outside the Corps.

STATEMENT (1): THIS CONFERENCE SERVED A USEFUL PURPOSE.

STRONGLY AGREE	56.7%	:*****
AGREE	42.7%	:*****
NO PREFERENCE	0. %	:
DISAGREE	0. %	:
STRONG DISAGREE	0. %	:
NO VOTE	0.7%	:

STATEMENT (2): FUTURE CONFERENCES OF THIS TYPE SHOULD BE PLANNED IN THE SAME WAY THIS WAS DONE.

STRONGLY AGREE	16.7%	:*****
AGREE	54.7%	:*****
NO PREFERENCE	20.0%	:*****
DISAGREE	8.0%	:***
STRONG DISAGREE	0. %	:
NC VOTE	0.7%	:

STATEMENT (3): NATIONAL (CORPS-WIDE) CONFERENCES OF THIS TYPE ARE TOO BIG TO ACHIEVE VERY MUCH.

STRONGLY AGREE	1.3%	:*
AGREE	5.3%	:**
NC PREFERENCE	14.7%	:*****
DISAGREE	58.0%	:*****
STRONG DISAGREE	20.0%	:*****
NO VOTE	0.7%	:

STATEMENT (4): REGIONAL CONFERENCES OF THIS TYPE WOULD BE MORE USEFUL (THAN NATION-WIDE CONFERENCES).

STRONGLY AGREE	6.0%	:**
AGREE	16.7%	:*****
NC PREFERENCE	28.0%	:*****
DISAGREE	40.0%	:*****
STRONG DISAGREE	6.7%	:***
NO VOTE	2.7%	:*

Figure 11. Evaluation of computer aided design
in structural engineering (Sheet 1 of 16)

AD-A031 243

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTE--ETC F/G 9/2
CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL EN--ETC(U)
AUG 76 N RADHAKRISHNAN, J B CHEEK

UNCLASSIFIED

2 OF 2
ADA031243



NL



END

DATE
FILMED
11 - 76

STATEMENT (5): A COMBINATION OF REGIONAL AND NATIONAL CONFERENCES
IS THE BEST WAY TO DO IT.

STRONGLY AGREE 14.0% :*****
AGREE 43.3% :*****
NC PREFERENCE 24.7% :*****
DISAGREE 16.0% :*****
STRONG DISAGREE 0.7% :
NO VOTE 1.3% :*

STATEMENT (6): INTER-DISCIPLINARY CONFERENCES OF THIS TYPE (EX.
SCIL-STRUCTURE INTERACTION) WILL BE VERY USEFUL.

STRONGLY AGREE 15.3% :*****
AGREE 50.0% :*****
NC PREFERENCE 18.7% :*****
DISAGREE 12.0% :*****
STRONG DISAGREE 1.3% :*
NO VOTE 2.7% :*

STATEMENT (7): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR
DISCIPLINES MUST BE CONDUCTED EVERY YEAR.

STRONGLY AGREE 10.7% :****
AGREE 17.3% :*****
NO PREFERENCE 18.0% :*****
DISAGREE 29.3% :*****
STRONG DISAGREE 4.0% :**
NO VOTE 20.7% :*****

STATEMENT (8): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR
DISCIPLINES MUST BE CONDUCTED ALTERNATE YEARS.

STRONGLY AGREE 15.3% :*****
AGREE 40.0% :*****
NC PREFERENCE 16.0% :*****
DISAGREE 6.7% :***
STRONG DISAGREE 1.3% :*
NO VOTE 20.7% :*****

Figure 11 (sheet 2 of 16)

STATEMENT (9): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED ONCE IN 3 YEARS.

STRONGLY AGREE	4.7%	: **
AGREE	21.3%	: *****
NO PREFERENCE	15.3%	: *****
DISAGREE	20.7%	: *****
STRONG DISAGREE	7.3%	: ***
NO VOTE	30.7%	: *****

STATEMENT (10): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED ONCE IN 5 YEARS.

STRONGLY AGREE	2.0%	: *
AGREE	3.3%	: *
NO PREFERENCE	7.3%	: ***
DISAGREE	32.7%	: *****
STRONG DISAGREE	20.7%	: *****
NO VOTE	34.0%	: *****

STATEMENT (11): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED NEVER (AGAIN).

STRONGLY AGREE	1.3%	: *
AGREE	0. %	:
NO PREFERENCE	1.3%	: *
DISAGREE	10.7%	: ****
STRONG DISAGREE	53.3%	: *****
NO VOTE	33.3%	: *****

STATEMENT (12): THIS CONFERENCES WAS GOOD BECAUSE I MET OTHER STRUCTURAL ENGINEERS IN THE CORPS.

STRONGLY AGREE	82.0%	: *****
AGREE	0. %	:
NO PREFERENCE	0. %	:
DISAGREE	0. %	:
STRONG DISAGREE	0. %	:
NO VOTE	18.0%	: *****

Figure 11 (sheet 3 of 16)

STATEMENT (13): THIS CONFERENCE WAS GOOD BECAUSE I GOT A LIST OF
PROGRAMS AVAILABLE FOR STRUCTURAL DESIGN.

STRONGLY AGREE 80.0% :*****
 AGREE 0. % :
 NO PREFERENCE 0. % :
 DISAGREE 0. % :
 STRONG DISAGREE 0. % :
 NO VOTE 20.0% :*****

STATEMENT (14): THIS CONFERENCE WAS GOOD BECAUSE I ENJOYED NEW
CRLEANS AND THE EVENING ACTIVITIES.

STRONGLY AGREE 59.3% :*****
 AGREE 0. % :
 NO PREFERENCE 0. % :
 DISAGREE 0. % :
 STRONG DISAGREE 0. % :
 NO VOTE 40.7% :*****

STATEMENT (15): THIS CONFERENCE WAS GOOD BECAUSE OF OTHER REASONS
FOR OR AGAINST--ADD COMMENTS BELOW.

STRONGLY AGREE 20.0% :*****
 AGREE 0. % :
 NO PREFERENCE 0. % :
 DISAGREE 0.7% :
 STRONG DISAGREE 0. % :
 NO VOTE 79.3% :*****

STATEMENT (16): THIS IS THE BEST WAY TO CONDUCT SPECIALITY
SESSIONS.

STRONGLY AGREE 7.3% :***
 AGREE 47.3% :*****
 NO PREFERENCE 26.0% :*****
 DISAGREE 12.0% :*****
 STRONG DISAGREE 2.7% :*
 NO VOTE 4.7% :**

Figure 11 (sheet 4 of 16)

STATEMENT (17): THE TOPICS IN THE SPECIALITY SESSIONS WERE TOO NARROW.

STRONGLY AGREE	0.7%	:
AGREE	4.7%	:**
NO PREFERENCE	24.0%	:*****
DISAGREE	58.0%	:*****
STRONG DISAGREE	8.0%	:***
NO VOTE	4.7%	:**

STATEMENT (18): IN THE SPECIALITY SESSIONS, TOO LITTLE TIME WAS ALLOWED FOR EACH TOPIC.

STRONGLY AGREE	20.7%	:*****
AGREE	53.3%	:*****
NO PREFERENCE	11.3%	:*****
DISAGREE	12.0%	:*****
STRONG DISAGREE	0.7%	:
NC VOTE	2.0%	:*

STATEMENT (19): THERE WAS TOO MUCH DUPLICATION IN EACH SPECIALITY SESSION.

STRONGLY AGREE	1.3%	:*
AGREE	4.7%	:**
NO PREFERENCE	20.0%	:*****
DISAGREE	62.0%	:*****
STRONG DISAGREE	6.0%	:**
NC VOTE	6.0%	:**

STATEMENT (20): THE DIVISION PRESENTATIONS SERVED A USEFUL PURPOSE.

STRONGLY AGREE	6.0%	:**
AGREE	49.3%	:*****
NO PREFERENCE	21.3%	:*****
DISAGREE	20.0%	:*****
STRONG DISAGREE	2.7%	:*
NO VOTE	0.7%	:

Figure 11 (sheet 5 of 16)

STATEMENT (21): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM THE PROJECT IT SERVES.

STRONGLY AGREE	0. %	:
AGREE	8.7%	:***
NO PREFERENCE	22.0%	:*****
DISAGREE	43.3%	:*****
STRONG DISAGREE	24.0%	:*****
NO VOTE	2.0%	:*

STATEMENT (22): MONEY SHOULD BE PROVIDED FOR COMPUTER PROGRAM DEVELOPMENT INDEPENDENT OF THE PROJECTS.

STRONGLY AGREE	36.0%	:*****
AGREE	45.3%	:*****
NO PREFERENCE	15.3%	:*****
DISAGREE	2.7%	:*
STRONG DISAGREE	0.7%	:
NO VOTE	0. %	:

STATEMENT (23): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM THE DIVISION OFFICES.

STRONGLY AGREE	2.7%	:*
AGREE	16.0%	:*****
NO PREFERENCE	42.7%	:*****
DISAGREE	25.3%	:*****
STRONG DISAGREE	12.0%	:*****
NO VOTE	1.3%	:*

STATEMENT (24): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM OCE AS A "LINE ITEM" IN THE BUDGET TO CONGRESS.

STRONGLY AGREE	23.3%	:*****
AGREE	34.7%	:*****
NO PREFERENCE	34.0%	:*****
DISAGREE	4.7%	:**
STRONG DISAGREE	2.0%	:*
NO VOTE	1.3%	:*

Figure 11 (sheet 6 of 16)

STATEMENT (25): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM A SURCHARGE (TAX) ON ALL STRUCTURAL DESIGN TASKS.

STRONGLY AGREE 3.3% :*
AGREE 18.0% :*****
NO PREFERENCE 43.3% :*****
DISAGREE 22.7% :*****
STRONG DISAGREE 10.0% :****
NO VOTE 2.7% :*

STATEMENT (26): THE CORP SHOULD GET OUT OF THE PROGRAM DEVELOPMENT BUSINESS AND CONTRACT THAT WORK OUT.

STRONGLY AGREE 1.3% :*
AGREE 1.3% :*
NC PREFERENCE 12.0% :*****
DISAGREE 46.0% :*****
STRONG DISAGREE 38.7% :*****
NC VOTE 0.7% :

STATEMENT (27): PRIVATE FIRMS, COLLEGES, ETC. ARE A GOOD SOURCE OF CORPS-CRIENTED PROGRAMS.

STRONGLY AGREE 4.0% :**
AGREE 42.7% :*****
NO PREFERENCE 26.7% :*****
DISAGREE 17.3% :*****
STRONG DISAGREE 6.0% :**
NO VOTE 3.3% :*

STATEMENT (28): THE CORPS NEEDS TO PLACE GREATER STRESS ON DEVELOPING GOOD DESIGN PROGRAMS.

STRONGLY AGREE 30.0% :*****
AGREE 60.0% :*****
NO PREFERENCE 7.3% :***
DISAGREE 1.3% :*
STRONG DISAGREE 0.7% :
NO VOTE 0.7% :

Figure 11 (sheet 7 of 16)

STATEMENT (29): COMPUTER PROGRAMS OFFER LITTLE AID TO THE DESIGNER. DESIGN IS A PEOPLE, NOT A COMPUTER PROCESS.

STRONGLY AGREE	1.3%	.*
AGREE	1.3%	.*
NO PREFERENCE	2.7%	.*
DISAGREE	43.3%	*****
STRONG DISAGREE	50.7%	*****
NC VOTE	0.7%	:

STATEMENT (30): THE CORPS WOULD BE BETTER USING TRAD. DESIGN METH. AND COMPUTER \$ FOR PEOPLE AND HAND-HELD CALCULATORS.

STRONGLY AGREE	1.3%	.*
AGREE	0.7%	:
NO PREFERENCE	2.0%	.*
DISAGREE	31.3%	*****
STRONG DISAGREE	64.0%	*****
NC VOTE	0.7%	:

STATEMENT (31): PROG. WRITTEN BY ONE DIV. CAN USUALLY BE USED BY OTHER DIVS. IF THEY HAVE WELL WRITTEN USER GUIDES.

STRONGLY AGREE	14.0%	*****
AGREE	62.0%	*****
NO PREFERENCE	16.0%	*****
DISAGREE	6.0%	.*
STRONG DISAGREE	1.3%	.*
NO VOTE	0.7%	:

STATEMENT (32): IT IS EASY TO WRITE A GOOD USER GUIDE FOR A COMPUTER PROGRAM.

STRONGLY AGREE	1.3%	.*
AGREE	11.3%	*****
NO PREFERENCE	27.3%	*****
DISAGREE	39.3%	*****
STRONG DISAGREE	19.3%	*****
NO VOTE	1.3%	.*

Figure 11 (sheet 8 of 16)

STATEMENT (33): MOST CORPS WRITTEN USER GUIDES ARE WELL WRITTEN
AND CLEARLY SHOW HOW TO USE THE PROGRAM.

STRONGLY AGREE	0. %	:
AGREE	6.0%	**
NO PREFERENCE	32.0%	*****
DISAGREE	49.3%	*****
STRONG DISAGREE	11.3%	*****
NO VOTE	1.3%	*

STATEMENT (34): THE CORPS PROG. AND DOCUMENTATION STDS. ARE REAL-
ISTIC, ENG.-ORIENTED AND SHOULD BE CLOSELY FOLLOWED.

STRONGLY AGREE	1.3%	*
AGREE	21.3%	*****
NO PREFERENCE	46.7%	*****
DISAGREE	24.0%	*****
STRONG DISAGREE	3.3%	*
NO VOTE	3.3%	*

STATEMENT (35): INTERACTIVE SYS. LIKE CORPS OR FACTS OFFER MANY
ADVANTAGES TO THE CURRENT ENGINEER-COMPUTER USER.

STRONGLY AGREE	12.0%	*****
AGREE	56.0%	*****
NO PREFERENCE	26.7%	*****
DISAGREE	2.0%	*
STRONG DISAGREE	1.3%	*
NO VOTE	2.0%	*

STATEMENT (36): I THINK THE LARGE PERCENTAGE OF MY WORK
CAN BE DONE IN THE INTERACTIVE MODE.

STRONGLY AGREE	9.3%	****
AGREE	37.3%	*****
NO PREFERENCE	38.7%	*****
DISAGREE	8.7%	***
STRONG DISAGREE	2.0%	*
NO VOTE	4.0%	**

Figure 11 (sheet 9 of 16)

STATEMENT (37): THE NUMBER OF TERMINALS AVAILABLE IN MY OFFICE IS INADEQUATE FOR DOING INTERACTIVE DESIGN.

STRONGLY AGREE	13.3%	:*****
AGREE	34.0%	:*****
NO PREFERENCE	25.3%	:*****
DISAGREE	18.7%	:*****
STRONG DISAGREE	6.0%	:**
NO VOTE	2.7%	:*

STATEMENT (38): EVERY USER GUIDE SHOULD CONTAIN A FLOW CHART.

STRONGLY AGREE	15.3%	:*****
AGREE	50.0%	:*****
NO PREFERENCE	16.7%	:*****
DISAGREE	12.0%	:*****
STRONG DISAGREE	1.3%	:*
NO VOTE	4.7%	:**

STATEMENT (39): EVERY USER GUIDE SHOULD CONTAIN A PROGRAM LISTING.

STRONGLY AGREE	30.0%	:*****
AGREE	55.3%	:*****
NO PREFERENCE	6.7%	:***
DISAGREE	3.3%	:*
STRONG DISAGREE	0.7%	:
NO VOTE	4.0%	:**

STATEMENT (40): EVERY USER GUIDE SHOULD CONTAIN AN EXAMPLE PROBLEM.

STRONGLY AGREE	64.0%	:*****
AGREE	32.7%	:*****
NO PREFERENCE	0.7%	:
DISAGREE	0. %	:
STRONG DISAGREE	0. %	:
NO VOTE	2.7%	:*

Figure 11 (sheet 10 of 16)

STATEMENT (41): EVERY USER GUIDE SHOULD CONTAIN A DETAILED DISCUSSION OF THE THEORY AND METHOD.

STRONGLY AGREE	36.0%	:*****
AGREE	42.7%	:*****
NO PREFERENCE	13.3%	:*****
DISAGREE	4.7%	:**
STRONG DISAGREE	0.7%	:
NO VOTE	2.7%	:*

STATEMENT (42): EVERY USER GUIDE SHOULD CCNTAIN THE DEFINITION OF ALL PROGRAM VARIABLES.

STRONGLY AGREE	43.3%	:*****
AGREE	45.3%	:*****
NC PREFERENCE	5.3%	:**
DISAGREE	3.3%	:*
STRONG DISAGREE	0. %	:
NO VOTE	2.7%	:*

STATEMENT (43): EVERY USER GUIDE SHOULD CCNTAIN AN EXPLANATION OF ALL INPUT AND CUTPUT DATA.

STRONGLY AGREE	59.3%	:*****
AGREE	36.7%	:*****
NO PREFERENCE	0.7%	:
DISAGREE	0. %	:
STRONG DISAGREE	0.7%	:
NO VOTE	2.7%	:*

STATEMENT (44): SYSTEMS LIKE NASTRAN, SAP, ETC. OFFER MANY ADVANTAES TO THE CURRENT OR FUTURE COMPUTER USER.

STRONGLY AGREE	33.3%	:*****
AGREE	45.3%	:*****
NO PREFERFNCE	17.3%	:*****
DISAGREE	1.3%	:*
STRONG DISAGREE	0. %	:
NO VOTE	2.7%	:*

Figure 11 (sheet 11 of 16)

STATEMENT (45): MY ENGINEERING COMPUTER NEEDS COULD BE BETTER MET
BY INSTALLING A MINI COMPUTER AT EACH DISTRICT OFFICE.

STRONGLY AGREE	7.3%	:***
AGREE	17.3%	:*****
NO PREFERENCE	41.3%	:*****
DISAGREE	22.0%	:*****
STRONG DISAGREE	8.0%	:***
NO VOTE	4.0%	:**

STATEMENT (46): THE CORPS NEEDS ITS OWN CENTRALIZED COMPUTER
FACILITY.

STRONGLY AGREE	20.0%	:*****
AGREE	32.7%	:*****
NO PREFERENCE	32.0%	:*****
DISAGREE	10.0%	:****
STRONG DISAGREE	3.3%	:*
NO VOTE	2.0%	:*

STATEMENT (47): THE WAY OF THE FUTURE IS TO USE MINI COMPUTERS
ONLY.

STRONGLY AGREE	1.3%	:*
AGREE	0.7%	:
NO PREFERENCE	14.0%	:*****
DISAGREE	46.7%	:*****
STRONG DISAGREE	26.7%	:*****
NO VOTE	10.7%	:*****

STATEMENT (48): THE WAY OF THE FUTURE IS TO USE LARGE COMPUTERS
ONLY.

STRONGLY AGREE	4.0%	:**
AGREE	8.7%	:***
NO PREFERENCE	17.3%	:*****
DISAGREE	41.3%	:*****
STRONG DISAGREE	18.0%	:*****
NO VOTE	10.7%	:*****

Figure 11 (sheet 12 of 16)

STATEMENT (49): THE WAY OF THE FUTURE IS TO USE BOTH LARGE AND
MINI COMPUTERS.

STRONGLY AGREE	20.7%	:*****
AGREE	49.3%	:*****
NO PREFERENCE	16.0%	:*****
DISAGREE	6.7%	:***
STRONG DISAGREE	2.0%	:*
NC VOTE	5.3%	:**

STATEMENT (50): THE WAY OF THE FUTURE IS TO USE CORPS MANAGED
COMPUTERS.

STRONGLY AGREE	10.7%	:****
AGREE	32.0%	:*****
NC PREFERENCE	32.7%	:*****
DISAGREE	10.0%	:****
STRONG DISAGREE	5.3%	:**
NC VOTE	9.3%	:****

STATEMENT (51): THE WAY OF THE FUTURE IS TO USE CONTRACT COMPUTER
SERVICES.

STRONGLY AGREE	2.0%	:*
AGREE	32.0%	:*****
NC PREFERENCE	28.0%	:*****
DISAGREE	23.3%	:*****
STRONG DISAGREE	4.7%	:**
NO VOTE	10.0%	:****

STATEMENT (52): THE WAY OF THE FUTURE IS TO USE A COMBINATION OF
CORPS COMPUTER AND CONTRACT SERVICES.

STRONGLY AGREE	24.0%	:*****
AGREE	52.7%	:*****
NC PREFERENCE	14.7%	:*****
DISAGREE	4.7%	:**
STRONG DISAGREE	0.7%	:
NO VOTE	3.3%	:*

Figure 11 (sheet 13 of 16)

STATEMENT (53): INTERACTIVE COMPUTER GRAPHICS DEVICES WILL HAVE A MAJOR IMPACT ON COMPUTER AIDED DESIGN.

STRONGLY AGREE	32.7%	:*****
AGREE	49.3%	:*****
NC PREFERENCE	14.7%	:*****
DISAGREE	1.3%	:*
STRONG DISAGREE	2.7%	:
NC VOTE	1.3%	:*

STATEMENT (54): THE CORPS HAS NO COMPUTER RELATED NEEDS THAT PRIVATE FIRMS CAN NOT MEET.

STRONGLY AGREE	1.3%	:*
AGREE	14.0%	:*****
NO PREFERENCE	34.0%	:*****
DISAGREE	34.7%	:*****
STRONG DISAGREE	13.3%	:*****
NC VOTE	2.7%	:*

STATEMENT (55): THE LOW COST OF CORPS-MANAGED COMPUTERS IS A MAJOR REASON FOR UTILIZING THEM.

STRONGLY AGREE	2.7%	:*
AGREE	26.7%	:*****
NC PREFERENCE	48.7%	:*****
DISAGREE	18.7%	:*****
STRONG DISAGREE	0.7%	:
NC VOTE	2.7%	:*

STATEMENT (56): THE GOOD SERVICE OF PRIVATE COMPUTERS MORE THAN JUSTIFIES THEIR HIGH COST.

STRONGLY AGREE	4.0%	:**
AGREE	15.3%	:*****
NC PREFERENCE	52.7%	:*****
DISAGREE	21.3%	:*****
STRONG DISAGREE	2.7%	:*
NO VOTE	4.0%	:**

Figure 11 (sheet 14 of 16)

STATEMENT (57): THE CORPS SHOULD HAVE CORPS-WIDE CENTER(S) FOR
DEVELOPING AND MAINTAINING STRUCTURAL PROGRAMS.

STRONGLY AGREE	25.3%	:*****
AGREE	48.7%	:*****
NO PREFERENCE	15.3%	:*****
DISAGREE	6.0%	:**
STRONG DISAGREE	0.7%	:
NO VOTE	4.0%	:**

STATEMENT (58): OUR OFFICE ADP CENTER KEEPS ME WELL INFORMED OF
COMPUTER PROGRAMS THAT ARE AVAILABLE FOR MY WORK.

STRONGLY AGREE	7.3%	:***
AGREE	18.7%	:*****
NO PREFERENCE	22.0%	:*****
DISAGREE	38.7%	:*****
STRONG DISAGREE	8.7%	:***
NC VOTE	4.7%	:**

STATEMENT (59): OUR OFFICE ADP CENTER GIVES ADEQUATE SUPPORT FOR
MY ENGINEERING WORK.

STRONGLY AGREE	7.3%	:***
AGREE	34.7%	:*****
NC PREFERENCE	22.7%	:*****
DISAGREE	25.3%	:*****
STRONG DISAGREE	5.3%	:**
NO VOTE	4.7%	:**

STATEMENT (60): PRESENT TURN-AROUND TIME FOR COMPUTER PROGRAM AT
OUR OFFICE ADP CENTER IS ADEQUATE.

STRONGLY AGREE	4.7%	:**
AGREE	31.3%	:*****
NC PREFERENCE	21.3%	:*****
DISAGREE	30.7%	:*****
STRONG DISAGREE	7.3%	:***
NC VOTE	4.7%	:**

Figure 11 (sheet 15 of 16)

STATEMENT (61): A COMPUTER PROGRAMMING SECT./BRANCH WITHIN THE
ENGINEERING DIV. WILL HELP ME USE THE CCMP. MORE IN MY WORK.

STRONGLY AGREE	17.3%	:*****
AGREE	37.3%	:*****
NC PREFERENCE	24.0%	:*****
DISAGREE	15.3%	:*****
STRONG DISAGREE	2.0%	:*
NO VOTE	3.3%	:*

STATEMENT (62): ONE OR MORE FULL-TIME ENG. IN DIST. OFFICE NEEDED
FOR ENG. PRG. DEV. AND PROVIDING INFO. ON COMPUTER SYSTEMS.

STRONGLY AGREE	24.0%	:*****
AGREE	46.0%	:*****
NO PREFERENCE	19.3%	:*****
DISAGREE	6.0%	:**
STRONG DISAGREE	2.0%	:*
NC VOTE	2.0%	:*

Figure 11 (sheet 16 of 16)

Table II. Evaluation of Computer Aided Design
in Structural Engineering

STATEMENT(1): THIS CONFERENCE SERVED A USEFUL PURPOSE.

SUPERVI	STRONG A.	AGREE	NC PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	3/50.0%	3/50.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	22/62.9%	13/37.1%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
TOTAL	25/61.0%	16/39.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
NCN-SUP						
ADP	6/37.5%	10/62.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	37/57.8%	27/42.2%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
TOTAL	43/53.7%	37/46.2%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
SIGNED	68/56.2%	53/43.8%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
NCNAME	17/58.6%	11/37.9%	0/ 0. %	0/ 0. %	0/ 0. %	1/ 3.4%
OVERALL						
RATING	85/56.7%	64/42.7%	0/ 0. %	0/ 0. %	0/ 0. %	1/ 0.7%

STATEMENT(2): FUTURE CONFERENCES OF THIS TYPE SHOULD BE PLANNED
IN THE SAME WAY THIS WAS DONE.

SUPERVI	STRONG A.	AGREE	NC PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	3/50.0%	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	7/20.0%	18/51.4%	7/20.0%	3/ 8.6%	0/ 0. %	0/ 0. %
TOTAL	8/19.5%	21/51.2%	9/22.0%	3/ 7.3%	0/ 0. %	0/ 0. %
NON-SUP						
ADP	2/12.5%	11/68.8%	2/12.5%	1/ 6.3%	0/ 0. %	0/ 0. %
ENG	11/17.2%	36/56.3%	12/18.8%	5/ 7.8%	0/ 0. %	0/ 0. %
TOTAL	13/16.3%	47/58.7%	14/17.5%	6/ 7.5%	0/ 0. %	0/ 0. %
SIGNED	21/17.4%	68/56.2%	23/19.0%	9/ 7.4%	0/ 0. %	0/ 0. %
NCNAME	4/13.8%	14/48.3%	7/24.1%	3/10.3%	0/ 0. %	1/ 3.4%
OVERALL						
RATING	25/16.7%	82/54.7%	30/20.0%	12/ 8.0%	0/ 0. %	1/ 0.7%

STATEMENT(3): NATIONAL (CORPS-WIDE) CONFERENCES OF THIS TYPE ARE
TOO BIG TO ACHIEVE VERY MUCH.

SUPERVI	STRONG A.	AGREE	NC PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	0/ 0. %	4/66.7%	1/16.7%	0/ 0. %
ENG	0/ 0. %	3/ 8.6%	4/11.4%	18/51.4%	9/25.7%	1/ 2.9%
TOTAL	1/ 2.4%	3/ 7.3%	4/ 9.8%	22/53.7%	10/24.4%	1/ 2.4%
NON-SUP						
ADP	0/ 0. %	0/ 0. %	1/ 6.3%	9/56.3%	6/37.5%	0/ 0. %
ENG	1/ 1.6%	3/ 4.7%	11/17.2%	39/60.9%	10/15.6%	0/ 0. %
TOTAL	1/ 1.3%	3/ 3.7%	12/15.0%	48/60.0%	16/20.0%	0/ 0. %
SIGNED	2/ 1.7%	6/ 5.0%	16/13.2%	70/57.9%	26/21.5%	1/ 0.8%
NONAME	0/ 0. %	2/ 6.9%	6/20.7%	17/58.6%	4/13.8%	0/ 0. %
OVERALL						
RATING	2/ 1.3%	8/ 5.3%	22/14.7%	87/58.0%	30/20.0%	1/ 0.7%

(Continued)

Table II. (Continued)

STATEMENT(4): REGIONAL CONFERENCES OF THIS TYPE WOULD BE MORE USEFUL (THAN NATION-WIDE CONFERENCES).

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	3/50.0%	2/33.3%	0/ 0. %	0/ 0. %
ENG	4/11.4%	3/ 8.6%	5/14.3%	19/54.3%	1/ 2.9%	3/ 8.6%
TOTAL	5/12.2%	3/ 7.3%	8/19.5%	21/51.2%	1/ 2.4%	3/ 7.3%
NCN-SUP						
ADP	0/ 0. %	4/25.0%	8/50.0%	4/25.0%	0/ 0. %	0/ 0. %
ENG	4/ 6.3%	13/20.3%	16/25.0%	23/35.9%	7/10.9%	1/ 1.6%
TOTAL	4/ 5.0%	17/21.3%	24/30.0%	27/33.8%	7/ 8.8%	1/ 1.3%
SIGNED	9/ 7.4%	20/16.5%	32/26.4%	48/39.7%	8/ 6.6%	4/ 3.3%
NONAME	0/ 0. %	5/17.2%	10/34.5%	12/41.4%	2/ 6.9%	0/ 0. %
OVERALL						
RATING	9/ 6.0%	25/16.7%	42/28.0%	60/40.0%	10/ 6.7%	4/ 2.7%

STATEMENT(5): A COMBINATION OF REGIONAL AND NATIONAL CONFERENCES IS THE BEST WAY TO DO IT.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	2/33.3%	1/16.7%	1/16.7%	0/ 0. %	0/ 0. %
ENG	5/14.3%	14/40.0%	11/31.4%	4/11.4%	0/ 0. %	1/ 2.9%
TOTAL	7/17.1%	16/39.0%	12/29.3%	5/12.2%	0/ 0. %	1/ 2.4%
NCN-SUP						
ADP	2/12.5%	7/43.8%	4/25.0%	2/12.5%	0/ 0. %	1/ 6.3%
ENG	6/ 9.4%	30/46.9%	16/25.0%	11/17.2%	1/ 1.6%	0/ 0. %
TOTAL	8/10.0%	37/46.2%	20/25.0%	13/16.3%	1/ 1.3%	1/ 1.3%
SIGNED	15/12.4%	53/43.8%	32/26.4%	18/14.9%	1/ 0.8%	2/ 1.7%
NONAME	6/20.7%	12/41.4%	5/17.2%	6/20.7%	0/ 0. %	0/ 0. %
OVERALL						
RATING	21/14.0%	65/43.3%	37/24.7%	24/16.0%	1/ 0.7%	2/ 1.3%

STATEMENT(6): INTER-DISCIPLINARY CONFERENCES OF THIS TYPE (EX. SOIL-STRUCTURE INTERACTION) WILL BE VERY USEFUL.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	3/50.0%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	3/ 8.6%	16/45.7%	4/11.4%	8/22.9%	2/ 5.7%	2/ 5.7%
TOTAL	3/ 7.3%	19/46.3%	6/14.6%	9/22.0%	2/ 4.9%	2/ 4.9%
NCN-SUP						
ADP	3/18.8%	7/43.8%	4/25.0%	1/ 6.3%	0/ 0. %	1/ 6.3%
ENG	10/15.6%	35/54.7%	12/18.8%	7/10.9%	0/ 0. %	0/ 0. %
TOTAL	13/16.3%	42/52.5%	16/20.0%	8/10.0%	0/ 0. %	1/ 1.3%
SIGNED	16/13.2%	61/50.4%	22/18.2%	17/14.0%	2/ 1.7%	3/ 2.5%
NONAME	7/24.1%	14/48.3%	6/20.7%	1/ 3.4%	0/ 0. %	1/ 3.4%
OVERALL						
RATING	23/15.3%	75/50.0%	28/18.7%	18/12.0%	2/ 1.3%	4/ 2.7%

(Continued)

Table II. (Continued)

STATEMENT(7): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED EVERY YEAR.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	1/16.7%	2/33.3%	1/16.7%	0/ 0. %	1/16.7%
ENG	5/14.3%	4/11.4%	4/11.4%	14/40.0%	2/ 5.7%	6/17.1%
TOTAL	6/14.6%	5/12.2%	6/14.6%	15/36.6%	2/ 4.9%	7/17.1%
NCN-SUP						
ADP	1/ 6.3%	3/18.8%	5/31.3%	3/18.8%	0/ 0. %	4/25.0%
ENG	6/ 9.4%	11/17.2%	11/17.2%	18/28.1%	2/ 3.1%	16/25.0%
TOTAL	7/ 8.8%	14/17.5%	16/20.0%	21/26.2%	2/ 2.5%	20/25.0%
SIGNED	13/10.7%	19/15.7%	22/18.2%	36/29.8%	4/ 3.3%	27/22.3%
NONAME	3/10.3%	7/24.1%	5/17.2%	8/27.6%	2/ 6.9%	4/13.8%
OVERALL						
RATING	16/10.7%	26/17.3%	27/18.0%	44/29.3%	6/ 4.0%	31/20.7%

STATEMENT(8): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED ALTERNATE YEARS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	3/50.0%	1/16.7%	0/ 0. %	0/ 0. %	2/33.3%
ENG	6/17.1%	16/45.7%	4/11.4%	1/ 2.9%	1/ 2.9%	7/20.0%
TOTAL	6/14.6%	19/46.3%	5/12.2%	1/ 2.4%	1/ 2.4%	9/22.0%
NCN-SUP						
ADP	1/ 6.3%	12/75.0%	1/ 6.3%	0/ 0. %	0/ 0. %	2/12.5%
ENG	11/17.2%	19/29.7%	13/20.3%	4/ 6.3%	0/ 0. %	17/26.6%
TOTAL	12/15.0%	31/38.8%	14/17.5%	4/ 5.0%	0/ 0. %	19/23.7%
SIGNED	18/14.9%	50/41.3%	19/15.7%	5/ 4.1%	1/ 0.8%	28/23.1%
NONAME	5/17.2%	10/34.5%	5/17.2%	5/17.2%	1/ 3.4%	3/10.3%
OVERALL						
RATING	23/15.3%	60/40.0%	24/16.0%	10/ 6.7%	2/ 1.3%	31/20.7%

STATEMENT(9): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED ONCE IN 3 YEARS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	1/16.7%	2/33.3%	0/ 0. %	0/ 0. %	2/33.3%
ENG	2/ 5.7%	6/17.1%	3/ 8.6%	6/17.1%	5/14.3%	13/37.1%
TOTAL	3/ 7.3%	7/17.1%	5/12.2%	6/14.6%	5/12.2%	15/36.6%
NON-SUP						
ADP	1/ 6.3%	2/12.5%	6/37.5%	2/12.5%	1/ 6.3%	4/25.0%
ENG	2/ 3.1%	16/25.0%	7/10.9%	14/21.9%	4/ 6.3%	21/32.8%
TOTAL	3/ 3.7%	18/22.5%	13/16.3%	16/20.0%	5/ 6.2%	25/31.2%
SIGNED	6/ 5.0%	25/20.7%	18/14.9%	22/18.2%	10/ 8.3%	40/33.1%
NONAME	1/ 3.4%	7/24.1%	5/17.2%	9/31.0%	1/ 3.4%	6/20.7%
OVERALL						
RATING	7/ 4.7%	32/21.3%	23/15.3%	31/20.7%	11/ 7.3%	46/30.7%

(Continued)

Table II. (Continued)

STATEMENT(10): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED ONCE IN 5 YEARS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	1/16.7%	2/33.3%	0/ 0. %	3/50.0%
ENG	0/ 0. %	0/ 0. %	2/ 5.7%	7/20.0%	11/31.4%	15/42.9%
TOTAL	0/ 0. %	0/ 0. %	3/ 7.3%	9/22.0%	11/26.8%	18/43.9%
NCN-SUP						
ADP	0/ 0. %	0/ 0. %	4/25.0%	5/31.3%	2/12.5%	5/31.3%
ENG	2/ 3.1%	3/ 4.7%	2/ 3.1%	24/37.5%	10/15.6%	23/35.9%
TOTAL	2/ 2.5%	3/ 3.7%	6/ 7.5%	29/36.3%	12/15.0%	28/35.0%
SIGNED	2/ 1.7%	3/ 2.5%	9/ 7.4%	38/31.4%	23/19.0%	46/38.0%
NONAME	1/ 3.4%	2/ 6.9%	2/ 6.9%	11/37.9%	8/27.6%	5/17.2%
OVERALL						
RATING	3/ 2.0%	5/ 3.3%	11/ 7.3%	49/32.7%	31/20.7%	51/34.0%

STATEMENT(11): NATIONAL CONFERENCES OF THIS TYPE FOR PARTICULAR DISCIPLINES MUST BE CONDUCTED NEVER (AGAIN).

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	3/50.0%	3/50.0%
ENG	0/ 0. %	0/ 0. %	0/ 0. %	3/ 8.6%	18/51.4%	14/40.0%
TOTAL	0/ 0. %	0/ 0. %	0/ 0. %	3/ 7.3%	21/51.2%	17/41.5%
NCN-SUP						
ADP	0/ 0. %	0/ 0. %	1/ 6.3%	1/ 6.3%	9/56.3%	5/31.3%
ENG	2/ 3.1%	0/ 0. %	1/ 1.6%	9/14.1%	30/46.9%	22/34.4%
TOTAL	2/ 2.5%	0/ 0. %	2/ 2.5%	10/12.5%	39/48.7%	27/33.8%
SIGNED	2/ 1.7%	0/ 0. %	2/ 1.7%	13/10.7%	60/49.6%	44/36.4%
NCNAME	0/ 0. %	0/ 0. %	0/ 0. %	3/10.3%	20/69.0%	6/20.7%
OVERALL						
RATING	2/ 1.3%	0/ 0. %	2/ 1.3%	16/10.7%	80/53.3%	50/33.3%

STATEMENT(12): THIS CONFERENCES WAS GOOD BECAUSE I MET OTHER STRUCTURAL ENGINEERS IN THE CORPS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	2/33.3%
ENG	30/85.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	5/14.3%
TOTAL	34/82.9%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	7/17.1%
NCN-SUP						
ADP	13/81.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	3/18.8%
ENG	51/79.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	13/20.3%
TOTAL	64/80.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	16/20.0%
SIGNED	98/81.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	23/19.0%
NONAME	25/86.2%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	4/13.8%
OVERALL						
RATING	123/82.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	27/18.0%

(Continued)

Table II. (Continued)

STATEMENT(13): THIS CONFERENCE WAS GOOD BECAUSE I GOT A LIST OF PROGRAMS AVAILABLE FOR STRUCTURAL DESIGN.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	2/33.3%
ENG	29/82.9%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	6/17.1%
TCTAL	33/80.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	8/19.5%
NON-SUP						
ADP	13/81.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	3/18.8%
ENG	50/78.1%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	14/21.9%
TCTAL	63/78.8%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	17/21.3%
SIGNED	96/79.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	25/20.7%
NCNAME	24/82.8%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	5/17.2%
OVERALL						
RATING	120/80.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	30/20.0%

STATEMENT(14): THIS CONFERENCE WAS GOOD BECAUSE I ENJOYED NEW ORLEANS AND THE EVENING ACTIVITIES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	2/33.3%
ENG	21/60.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	14/40.0%
TOTAL	25/61.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	16/39.0%
NON-SUP						
ADP	11/68.8%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	5/31.3%
ENG	36/56.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	28/43.8%
TOTAL	47/58.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	33/41.3%
SIGNED	72/59.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	49/40.5%
NCNAME	17/58.6%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	12/41.4%
OVERALL						
RATING	89/59.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	61/40.7%

STATEMENT(15): THIS CONFERENCE WAS GOOD BECAUSE OF OTHER REASONS FOR OR AGAINST--ADD COMMENTS BELOW.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	4/66.7%
ENG	6/17.1%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	29/82.9%
TCTAL	8/19.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	33/80.5%
NCN-SUP						
ADP	2/12.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	14/87.5%
ENG	14/21.9%	0/ 0. %	0/ 0. %	1/ 1.6%	0/ 0. %	49/76.6%
TCTAL	16/20.0%	0/ 0. %	0/ 0. %	1/ 1.3%	0/ 0. %	63/78.8%
SIGNED	24/19.8%	0/ 0. %	0/ 0. %	1/ 0.8%	0/ 0. %	96/79.3%
NONAME	6/20.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	23/79.3%
OVERALL						
RATING	30/20.0%	0/ 0. %	0/ 0. %	1/ 0.7%	0/ 0. %	119/79.3%

(Continued)

Table II. (Continued)

STATEMENT(16): THIS IS THE BEST WAY TO CONDUCT SPECIALITY SESSIONS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	1/16.7%	4/66.7%	1/16.7%	0/ 0. %	0/ 0. %
ENG	3/ 8.6%	17/48.6%	8/22.9%	4/11.4%	1/ 2.9%	2/ 5.7%
TOTAL	3/ 7.3%	18/43.9%	12/29.3%	5/12.2%	1/ 2.4%	2/ 4.9%
NON-SUP						
ADP	0/ 0. %	9/56.3%	4/25.0%	2/12.5%	1/ 6.3%	0/ 0. %
ENG	6/ 9.4%	31/48.4%	16/25.0%	6/ 9.4%	0/ 0. %	5/ 7.8%
TOTAL	6/ 7.5%	40/50.0%	20/25.0%	8/10.0%	1/ 1.3%	5/ 6.2%
SIGNED	9/ 7.4%	58/47.9%	32/26.4%	13/10.7%	2/ 1.7%	7/ 5.8%
NCNAME	2/ 6.9%	13/44.8%	7/24.1%	5/17.2%	2/ 6.9%	0/ 0. %
OVFRALL						
RATING	11/ 7.3%	71/47.3%	39/26.0%	18/12.0%	4/ 2.7%	7/ 4.7%

STATEMENT(17): THE TOPICS IN THE SPECIALITY SESSIONS WERE TOO NARROW.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	1/16.7%	3/50.0%	1/16.7%	1/16.7%
ENG	0/ 0. %	2/ 5.7%	4/11.4%	24/68.6%	4/11.4%	1/ 2.9%
TOTAL	0/ 0. %	2/ 4.9%	5/12.2%	27/65.9%	5/12.2%	2/ 4.9%
NON-SUP						
ADP	0/ 0. %	0/ 0. %	8/50.0%	8/50.0%	0/ 0. %	0/ 0. %
ENG	1/ 1.6%	2/ 3.1%	12/18.8%	41/64.1%	5/ 7.8%	3/ 4.7%
TOTAL	1/ 1.3%	2/ 2.5%	20/25.0%	49/61.2%	5/ 6.2%	3/ 3.7%
SIGNED	1/ 0.8%	4/ 3.3%	25/20.7%	76/62.8%	10/ 8.3%	5/ 4.1%
NCNAME	0/ 0. %	3/10.3%	11/37.9%	11/37.9%	2/ 6.9%	2/ 6.9%
CVFRALL						
RATING	1/ 0.7%	7/ 4.7%	36/24.0%	87/58.0%	12/ 8.0%	7/ 4.7%

STATEMENT(18): IN THE SPECIALITY SESSIONS, TOO LITTLE TIME WAS ALLOWED FOR EACH TOPIC.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	1/16.7%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	8/22.9%	20/57.1%	2/ 5.7%	4/11.4%	1/ 2.9%	0/ 0. %
TOTAL	10/24.4%	21/51.2%	4/ 9.8%	5/12.2%	1/ 2.4%	0/ 0. %
NON-SUP						
ADP	2/12.5%	6/37.5%	6/37.5%	2/12.5%	0/ 0. %	0/ 0. %
ENG	14/21.9%	38/59.4%	2/ 3.1%	8/12.5%	0/ 0. %	2/ 3.1%
TOTAL	16/20.0%	44/55.0%	8/10.0%	10/12.5%	0/ 0. %	2/ 2.5%
SIGNED	26/21.5%	65/53.7%	12/ 9.9%	15/12.4%	1/ 0.8%	2/ 1.7%
NCNAME	5/17.2%	15/51.7%	5/17.2%	3/10.3%	0/ 0. %	1/ 3.4%
CVFRALL						
RATING	31/20.7%	80/53.3%	17/11.3%	18/12.0%	1/ 0.7%	3/ 2.0%

(Continued)

Table II. (Continued)

STATEMENT(19): THERE WAS TOO MUCH DUPLICATION IN EACH SPECIALITY SESSION.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	0/ 0. %	5/83.3%	0/ 0. %	1/16.7%
ENG	0/ 0. %	2/ 5.7%	2/ 5.7%	26/74.3%	3/ 8.6%	2/ 5.7%
TCTAL	0/ 0. %	2/ 4.9%	2/ 4.9%	31/75.6%	3/ 7.3%	3/ 7.3%
NCN-SUP						
ADP	1/ 6.3%	0/ 0. %	7/43.3%	7/43.8%	0/ 0. %	1/ 6.3%
ENG	1/ 1.6%	2/ 3.1%	14/21.9%	39/60.9%	4/ 6.3%	4/ 6.3%
TOTAL	2/ 2.5%	2/ 2.5%	21/26.2%	46/57.5%	4/ 5.0%	5/ 6.2%
SIGNED	2/ 1.7%	4/ 3.3%	23/19.0%	77/63.6%	7/ 5.8%	8/ 6.6%
NCNAME	0/ 0. %	3/10.3%	7/24.1%	16/55.2%	2/ 6.9%	1/ 3.4%
OVERALL						
RATING	2/ 1.3%	7/ 4.7%	30/20.0%	93/62.0%	9/ 6.0%	9/ 6.0%

STATEMENT(20): THE DIVISION PRESENTATIONS SERVED A USEFUL PURPOSE.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	5/83.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	3/ 8.6%	19/54.3%	3/ 8.6%	7/20.0%	2/ 5.7%	1/ 2.9%
TOTAL	4/ 9.8%	24/58.5%	3/ 7.3%	7/17.1%	2/ 4.9%	1/ 2.4%
NON-SUP						
ADP	0/ 0. %	10/62.5%	6/37.5%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	3/ 4.7%	27/42.2%	16/25.0%	17/26.6%	1/ 1.6%	0/ 0. %
TCTAL	3/ 3.7%	37/46.2%	22/27.5%	17/21.3%	1/ 1.3%	0/ 0. %
SIGNED	7/ 5.8%	61/50.4%	25/20.7%	24/19.8%	3/ 2.5%	1/ 0.8%
NONAME	2/ 6.9%	13/44.8%	7/24.1%	6/20.7%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	9/ 6.0%	74/49.3%	32/21.3%	30/20.0%	4/ 2.7%	1/ 0.7%

STATEMENT(21): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM THE PROJECT IT SERVES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	2/33.3%	3/50.0%	1/16.7%	0/ 0. %
ENG	0/ 0. %	3/ 8.6%	5/14.3%	11/31.4%	14/40.0%	2/ 5.7%
TCTAL	0/ 0. %	3/ 7.3%	7/17.1%	14/34.1%	15/36.6%	2/ 4.9%
NON-SUP						
ADP	0/ 0. %	1/ 6.3%	3/18.8%	8/50.0%	4/25.0%	0/ 0. %
ENG	0/ 0. %	5/ 7.8%	15/23.4%	35/54.7%	9/14.1%	0/ 0. %
TCTAL	0/ 0. %	6/ 7.5%	18/22.5%	43/53.7%	13/16.3%	0/ 0. %
SIGNED	0/ 0. %	9/ 7.4%	25/20.7%	57/47.1%	28/23.1%	2/ 1.7%
NCNAME	0/ 0. %	4/13.8%	8/27.6%	8/27.6%	8/27.6%	1/ 3.4%
OVERALL						
RATING	0/ 0. %	13/ 8.7%	33/22.0%	65/43.3%	36/24.0%	3/ 2.0%

(Continued)

Table II. (Continued)

STATEMENT(22): MCNEY SHOULD BE PROVIDED FOR COMPUTER PROGRAM DEVELOPMENT INDEPENDENT OF THE PROJECTS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	3/50.0%	1/16.7%	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	17/48.6%	14/40.0%	4/11.4%	0/ 0. %	0/ 0. %	0/ 0. %
TOTAL	20/48.8%	15/36.6%	6/14.6%	0/ 0. %	0/ 0. %	0/ 0. %
NCN-SUP						
ADP	6/37.5%	7/43.8%	2/12.5%	1/ 6.3%	0/ 0. %	0/ 0. %
ENG	17/26.6%	33/51.6%	10/15.6%	3/ 4.7%	1/ 1.6%	0/ 0. %
TOTAL	23/28.7%	40/50.0%	12/15.0%	4/ 5.0%	1/ 1.3%	0/ 0. %
SIGNED	43/35.5%	55/45.5%	18/14.9%	4/ 3.3%	1/ 0.8%	0/ 0. %
NCNAME	11/37.9%	13/44.8%	5/17.2%	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	54/36.0%	68/45.3%	23/15.3%	4/ 2.7%	1/ 0.7%	0/ 0. %

STATEMENT(23): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM THE DIVISION OFFICES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	1/16.7%	3/50.0%	2/33.3%	0/ 0. %	0/ 0. %
ENG	1/ 2.9%	5/14.3%	9/25.7%	13/37.1%	6/17.1%	1/ 2.9%
TOTAL	1/ 2.4%	6/14.6%	12/29.3%	15/36.6%	6/14.6%	1/ 2.4%
NCN-SUP						
ADP	1/ 6.3%	3/18.8%	8/50.0%	2/12.5%	1/ 6.3%	1/ 6.3%
ENG	2/ 3.1%	9/14.1%	34/53.1%	12/18.8%	7/10.9%	0/ 0. %
TOTAL	3/ 3.7%	12/15.0%	42/52.5%	14/17.5%	8/10.0%	1/ 1.3%
SIGNED	4/ 3.3%	18/14.9%	54/44.6%	29/24.0%	14/11.6%	2/ 1.7%
NCNAME	0/ 0. %	6/20.7%	10/34.5%	9/31.0%	4/13.8%	0/ 0. %
OVERALL						
RATING	4/ 2.7%	24/16.0%	64/42.7%	38/25.3%	18/12.0%	2/ 1.3%

STATEMENT(24): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM OCE AS A "LINE ITEM" IN THE BUDGET TO CONGRESS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	3/50.0%	1/16.7%	0/ 0. %	1/16.7%	0/ 0. %
ENG	13/37.1%	11/31.4%	5/14.3%	4/11.4%	1/ 2.9%	1/ 2.9%
TOTAL	14/34.1%	14/34.1%	6/14.6%	4/ 9.8%	2/ 4.9%	1/ 2.4%
NCN-SUP						
ADP	2/12.5%	8/50.0%	4/25.0%	1/ 6.3%	0/ 0. %	1/ 6.3%
ENG	12/18.8%	18/28.1%	32/50.0%	1/ 1.6%	1/ 1.6%	0/ 0. %
TOTAL	14/17.5%	26/32.5%	36/45.0%	2/ 2.5%	1/ 1.3%	1/ 1.3%
SIGNED	28/23.1%	40/33.1%	42/34.7%	6/ 5.0%	3/ 2.5%	2/ 1.7%
NONAME	7/24.1%	12/41.4%	9/31.0%	1/ 3.4%	0/ 0. %	0/ 0. %
OVERALL						
RATING	35/23.3%	52/34.7%	51/34.0%	7/ 4.7%	3/ 2.0%	2/ 1.3%

(Continued)

Table 11. (Continued)

STATEMENT(25): COMPUTER PROGRAM DEVELOPMENT MONEY SHOULD COME FROM A SURCHARGE (TAX) ON ALL STRUCTURAL DESIGN TASKS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	3/50.0%	1/16.7%	1/16.7%	0/ 0. %
ENG	0/ 0. %	5/14.3%	11/31.4%	12/34.3%	5/14.3%	2/ 5.7%
TCTAL	1/ 2.4%	5/12.2%	14/34.1%	13/31.7%	6/14.6%	2/ 4.9%
NON-SUP						
ADP	1/ 6.3%	0/ 0. %	10/62.5%	3/18.8%	1/ 6.3%	1/ 6.3%
ENG	1/ 1.6%	20/31.3%	29/45.3%	11/17.2%	2/ 3.1%	1/ 1.6%
TCTAL	2/ 2.5%	20/25.0%	39/48.7%	14/17.5%	3/ 3.7%	2/ 2.5%
SIGNED	3/ 2.5%	25/20.7%	53/43.8%	27/22.3%	9/ 7.4%	4/ 3.3%
NCNAME	2/ 6.9%	2/ 6.9%	12/41.4%	7/24.1%	6/20.7%	0/ 0. %
OVERALL						
RATING	5/ 3.3%	27/18.0%	65/43.3%	34/22.7%	15/10.0%	4/ 2.7%

STATEMENT(26): THE CORP SHOULD GET OUT OF THE PROGRAM DEVELOPMENT BUSINESS AND CONTRACT THAT WORK OUT.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	0/ 0. %	2/33.3%	4/66.7%	0/ 0. %
ENG	0/ 0. %	0/ 0. %	7/20.0%	17/48.6%	11/31.4%	0/ 0. %
TOTAL	0/ 0. %	0/ 0. %	7/17.1%	19/46.3%	15/36.6%	0/ 0. %
NON-SUP						
ADP	0/ 0. %	1/ 6.3%	2/12.5%	4/25.0%	9/56.3%	0/ 0. %
ENG	2/ 3.1%	1/ 1.6%	5/ 7.8%	30/46.9%	25/39.1%	1/ 1.6%
TOTAL	2/ 2.5%	2/ 2.5%	7/ 8.8%	34/42.5%	34/42.5%	1/ 1.3%
SIGNED	2/ 1.7%	2/ 1.7%	14/11.6%	53/43.8%	49/40.5%	1/ 0.8%
NCNAME	0/ 0. %	0/ 0. %	4/13.8%	16/55.2%	9/31.0%	0/ 0. %
OVERALL						
RATING	2/ 1.3%	2/ 1.3%	18/12.0%	69/46.0%	58/38.7%	1/ 0.7%

STATEMENT(27): PRIVATE FIRMS, COLLEGES, ETC. ARE A GOOD SOURCE OF CORPS-ORIENTED PROGRAMS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	3/50.0%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	1/ 2.9%	12/34.3%	10/28.6%	8/22.9%	2/ 5.7%	2/ 5.7%
TOTAL	1/ 2.4%	15/36.6%	12/29.3%	9/22.0%	2/ 4.9%	2/ 4.9%
NON-SUP						
ADP	1/ 6.3%	9/56.3%	4/25.0%	1/ 6.3%	1/ 6.3%	0/ 0. %
ENG	1/ 1.6%	29/45.3%	16/25.0%	11/17.2%	4/ 6.3%	3/ 4.7%
TOTAL	2/ 2.5%	38/47.5%	20/25.0%	12/15.0%	5/ 6.2%	3/ 3.7%
SIGNED	3/ 2.5%	53/43.8%	32/26.4%	21/17.4%	7/ 5.8%	5/ 4.1%
NONAME	3/10.3%	11/37.9%	8/27.6%	5/17.2%	2/ 6.9%	0/ 0. %
OVERALL						
RATING	6/ 4.0%	64/42.7%	40/26.7%	26/17.3%	9/ 6.0%	5/ 3.3%

(Continued)

Table II. (Continued)

STATEMENT(28): THE CORPS NEEDS TO PLACE GREATER STRESS ON DEVELOPING GOOD DESIGN PROGRAMS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	4/66.7%	1/16.7%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	14/40.0%	20/57.1%	0/ 0. %	1/ 2.9%	0/ 0. %	0/ 0. %
TOTAL	15/36.6%	24/58.5%	1/ 2.4%	1/ 2.4%	0/ 0. %	0/ 0. %
NCN-SUP						
ADP	3/18.8%	12/75.0%	1/ 6.3%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	16/25.0%	39/60.9%	6/ 9.4%	1/ 1.6%	1/ 1.6%	1/ 1.6%
TOTAL	19/23.7%	51/63.7%	7/ 8.8%	1/ 1.3%	1/ 1.3%	1/ 1.3%
SIGNED	34/28.1%	75/62.0%	8/ 6.6%	2/ 1.7%	1/ 0.8%	1/ 0.8%
NCNAME	11/37.9%	15/51.7%	3/10.3%	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	45/30.0%	90/60.0%	11/ 7.3%	2/ 1.3%	1/ 0.7%	1/ 0.7%

STATEMENT(29): COMPUTER PROGRAMS OFFER LITTLE AID TO THE DESIGNER. DESIGN IS A PEOPLE, NOT A COMPUTER PROCESS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	0/ 0. %	2/33.3%	4/66.7%	0/ 0. %
ENG	0/ 0. %	0/ 0. %	2/ 5.7%	14/40.0%	19/54.3%	0/ 0. %
TOTAL	0/ 0. %	0/ 0. %	2/ 4.9%	16/39.0%	23/56.1%	0/ 0. %
NCN-SUP						
ADP	0/ 0. %	0/ 0. %	1/ 6.3%	8/50.0%	7/43.8%	0/ 0. %
ENG	2/ 3.1%	1/ 1.6%	0/ 0. %	27/42.2%	33/51.6%	1/ 1.6%
TOTAL	2/ 2.5%	1/ 1.3%	1/ 1.3%	35/43.7%	40/50.0%	1/ 1.3%
SIGNED	2/ 1.7%	1/ 0.8%	3/ 2.5%	51/42.1%	63/52.1%	1/ 0.8%
NCNAME	0/ 0. %	1/ 3.4%	1/ 3.4%	14/48.3%	13/44.8%	0/ 0. %
OVERALL						
RATING	2/ 1.3%	2/ 1.3%	4/ 2.7%	65/43.3%	76/50.7%	1/ 0.7%

STATEMENT(30): THE CORPS WOULD BE BETTER USING TRAD. DESIGN METH. AND COMPUTER \$ FOR PEOPLE AND HAND-HELD CALCULATORS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %	6/00.0%	0/ 0. %
ENG	0/ 0. %	0/ 0. %	0/ 0. %	14/40.0%	21/60.0%	0/ 0. %
TOTAL	0/ 0. %	0/ 0. %	0/ 0. %	14/34.1%	27/65.9%	0/ 0. %
NON-SUP						
ADP	0/ 0. %	0/ 0. %	1/ 6.3%	3/18.8%	12/75.0%	0/ 0. %
ENG	2/ 3.1%	1/ 1.6%	1/ 1.6%	16/25.0%	43/67.2%	1/ 1.6%
TOTAL	2/ 2.5%	1/ 1.3%	2/ 2.5%	19/23.7%	55/68.8%	1/ 1.3%
SIGNED	2/ 1.7%	1/ 0.8%	2/ 1.7%	33/27.3%	82/67.8%	1/ 0.8%
NCNAME	0/ 0. %	0/ 0. %	1/ 3.4%	14/48.3%	14/48.3%	0/ 0. %
OVERALL						
RATING	2/ 1.3%	1/ 0.7%	3/ 2.0%	47/31.3%	96/64.0%	1/ 0.7%

(Continued)

Table 11. (Continued)

STATEMENT(31): PPOG. WRITTEN BY ONE DIV. CAN USUALLY BE USED BY
CTHR DIVS. IF THEY HAVE WELL WRITTEN USER GUIDES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	3/50.0%	1/16.7%	1/16.7%	0/0.0%	0/0.0%
ENG	4/11.4%	22/62.9%	5/14.3%	2/5.7%	2/5.7%	0/0.0%
TOTAL	5/12.2%	25/61.0%	6/14.6%	3/7.3%	2/4.9%	0/0.0%
NCN-SUP						
ADP	1/6.3%	14/87.5%	1/6.3%	0/0.0%	0/0.0%	0/0.0%
ENG	10/15.6%	42/65.6%	9/14.1%	2/3.1%	0/0.0%	1/1.6%
TOTAL	11/13.7%	56/70.0%	10/12.5%	2/2.5%	0/0.0%	1/1.3%
SIGNED	16/13.2%	81/66.9%	16/13.2%	5/4.1%	2/1.7%	1/0.8%
NCNAME	5/17.2%	12/41.4%	8/27.6%	4/13.8%	0/0.0%	0/0.0%
OVERALL						
RATING	21/14.0%	93/62.0%	24/16.0%	9/6.0%	2/1.3%	1/0.7%

STATEMENT(32): IT IS EASY TO WRITE A GOOD USER GUIDE FOR A
COMPUTER PROGRAM.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	2/33.3%	0/0.0%	3/50.0%	0/0.0%	0/0.0%
ENG	0/0.0%	1/2.9%	10/28.6%	19/54.3%	4/11.4%	1/2.9%
TOTAL	1/2.4%	3/7.3%	10/24.4%	22/53.7%	4/9.8%	1/2.4%
NCN-SUP						
ADP	0/0.0%	3/18.8%	3/18.8%	6/37.5%	4/25.0%	0/0.0%
ENG	0/0.0%	7/10.9%	22/34.4%	21/32.8%	13/20.3%	1/1.6%
TOTAL	0/0.0%	10/12.5%	25/31.2%	27/33.8%	17/21.3%	1/1.3%
SIGNED	1/0.8%	13/10.7%	35/28.9%	49/40.5%	21/17.4%	2/1.7%
NCNAME	1/3.4%	4/13.8%	6/20.7%	10/34.5%	8/27.6%	0/0.0%
OVERALL						
RATING	2/1.3%	17/11.3%	41/27.3%	59/39.3%	29/19.3%	2/1.3%

STATEMENT(33): MOST CORPS WRITTEN USER GUIDES ARE WELL WRITTEN
AND CLEARLY SHOW HOW TO USE THE PROGRAM.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/0.0%	0/0.0%	2/33.3%	4/66.7%	0/0.0%	0/0.0%
ENG	0/0.0%	2/5.7%	8/22.9%	21/60.0%	2/5.7%	2/5.7%
TOTAL	0/0.0%	2/4.9%	10/24.4%	25/61.0%	2/4.9%	2/4.9%
NCN-SUP						
ADP	0/0.0%	0/0.0%	7/43.8%	7/43.8%	2/12.5%	0/0.0%
ENG	0/0.0%	5/7.8%	21/32.8%	31/48.4%	7/10.9%	0/0.0%
TOTAL	0/0.0%	5/6.2%	28/35.0%	38/47.5%	9/11.2%	0/0.0%
SIGNED	0/0.0%	7/5.8%	38/31.4%	63/52.1%	11/9.1%	2/1.7%
NCNAME	0/0.0%	2/6.9%	10/34.5%	11/37.9%	6/20.7%	0/0.0%
OVERALL						
RATING	0/0.0%	9/6.0%	48/32.0%	74/49.3%	17/11.3%	2/1.3%

(Continued)

Table II. (Continued)

STATEMENT(34): THE CORPS PROG. AND DOCUMENTATION STDS. ARE REAL-
ISTIC, ENG.-ORIENTED AND SHOULD BE CLOSELY FOLLOWED.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	0/ 0. %	6/20.0%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	0/ 0. %	8/22.9%	14/40.0%	9/25.7%	1/ 2.9%	3/ 8.6%
TOTAL	0/ 0. %	8/19.5%	20/48.8%	9/22.0%	1/ 2.4%	3/ 7.3%
NON-SUP						
ADP	1/ 6.3%	4/25.0%	6/37.5%	5/31.3%	0/ 0. %	0/ 0. %
ENG	0/ 0. %	15/23.4%	32/50.0%	13/20.3%	3/ 4.7%	1/ 1.6%
TCTAL	1/ 1.3%	19/23.7%	38/47.5%	18/22.5%	3/ 3.7%	1/ 1.3%
SIGNED	1/ 0.8%	27/22.3%	58/47.9%	27/22.3%	4/ 3.3%	4/ 3.3%
NONAME	1/ 3.4%	5/17.2%	12/41.4%	9/31.0%	1/ 3.4%	1/ 3.4%
OVERALL						
RATING	2/ 1.3%	32/21.3%	70/46.7%	36/24.0%	5/ 3.3%	5/ 3.3%

STATEMENT(35): INTERACTIVE SYS. LIKE CORPS OR FACTS OFFER MANY
ADVANTAGES TO THE CURRENT ENGINEER-COMPUTER USER.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	2/33.3%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	2/ 5.7%	22/62.9%	9/25.7%	0/ 0. %	0/ 0. %	2/ 5.7%
TOTAL	3/ 7.3%	24/58.5%	11/26.8%	1/ 2.4%	0/ 0. %	2/ 4.9%
NON-SUP						
ADP	4/25.0%	9/56.3%	3/18.8%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	6/ 9.4%	38/59.4%	17/26.6%	1/ 1.6%	1/ 1.6%	1/ 1.6%
TCTAL	10/12.5%	47/58.7%	20/25.0%	1/ 1.3%	1/ 1.3%	1/ 1.3%
SIGNED	13/10.7%	71/58.7%	31/25.6%	2/ 1.7%	1/ 0.8%	3/ 2.5%
NONAME	5/17.2%	13/44.8%	9/31.0%	1/ 3.4%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	18/12.0%	84/56.0%	40/26.7%	3/ 2.0%	2/ 1.3%	3/ 2.0%

STATEMENT(36): I THINK THE LARGE PERCENTAGE OF MY WORK
CAN BE DONE IN THE INTERACTIVE MODE.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	3/50.0%	3/50.0%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	1/ 2.9%	14/40.0%	15/42.9%	2/ 5.7%	0/ 0. %	3/ 8.6%
TOTAL	1/ 2.4%	17/41.5%	18/43.9%	2/ 4.9%	0/ 0. %	3/ 7.3%
NON-SUP						
ADP	3/18.8%	8/50.0%	4/25.0%	0/ 0. %	0/ 0. %	1/ 6.3%
ENG	7/10.9%	19/29.7%	27/42.2%	7/10.9%	2/ 3.1%	2/ 3.1%
TCTAL	10/12.5%	27/33.8%	31/38.8%	7/ 8.8%	2/ 2.5%	3/ 3.7%
SIGNED	11/ 9.1%	44/36.4%	49/40.5%	9/ 7.4%	2/ 1.7%	6/ 5.0%
NONAME	3/10.3%	12/41.4%	9/31.0%	4/13.8%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	14/ 9.3%	56/37.3%	58/38.7%	13/ 8.7%	3/ 2.0%	6/ 4.0%

(Continued)

Table II. (Continued)

STATEMENT(37): THE NUMBER OF TERMINALS AVAILABLE IN MY OFFICE IS INADEQUATE FOR DOING INTERACTIVE DESIGN.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	4/66.7%	1/16.7%	1/16.7%	0/ 0. %	0/ 0. %
ENG	3/ 8.6%	15/42.9%	5/14.3%	9/25.7%	0/ 0. %	3/ 8.6%
TCTAL	3/ 7.3%	19/46.3%	6/14.6%	10/24.4%	0/ 0. %	3/ 7.3%
NON-SUP						
ADP	1/ 6.3%	5/31.3%	4/25.0%	4/25.0%	1/ 6.3%	1/ 6.3%
ENG	10/15.6%	20/31.3%	18/28.1%	9/14.1%	7/10.9%	0/ 0. %
TOTAL	11/13.7%	25/31.2%	22/27.5%	13/16.3%	8/10.0%	1/ 1.3%
SIGNED	14/11.6%	44/36.4%	28/23.1%	23/19.0%	8/ 6.6%	4/ 3.3%
NONAME	6/20.7%	7/24.1%	10/34.5%	5/17.2%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	20/13.3%	51/34.0%	38/25.3%	28/18.7%	9/ 6.0%	4/ 2.7%

STATEMENT(38): EVERY USER GUIDE SHOULD CONTAIN A FLW CHART.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	2/33.3%	1/16.7%	2/33.3%	0/ 0. %	0/ 0. %
ENG	5/14.3%	19/54.3%	5/14.3%	1/ 2.9%	1/ 2.9%	4/11.4%
TOTAL	6/14.6%	21/51.2%	6/14.6%	3/ 7.3%	1/ 2.4%	4/ 9.8%
NON-SUP						
ADP	0/ 0. %	7/43.8%	6/37.5%	2/12.5%	0/ 0. %	1/ 6.3%
ENG	10/15.6%	32/50.0%	10/15.6%	9/14.1%	1/ 1.6%	2/ 3.1%
TCTAL	10/12.5%	39/48.7%	16/20.0%	11/13.7%	1/ 1.3%	3/ 3.7%
SIGNED	16/13.2%	60/49.6%	22/18.2%	14/11.6%	2/ 1.7%	7/ 5.8%
NONAME	7/24.1%	15/51.7%	3/10.3%	4/13.8%	0/ 0. %	0/ 0. %
OVERALL						
RATING	23/15.3%	75/50.0%	25/16.7%	18/12.0%	2/ 1.3%	7/ 4.7%

STATEMENT(39): EVERY USER GUIDE SHOULD CCNTAIN A PROGRAM LISTING.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	1/16.7%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	10/28.6%	19/54.3%	2/ 5.7%	0/ 0. %	0/ 0. %	4/11.4%
TOTAL	12/29.3%	20/48.8%	4/ 9.8%	1/ 2.4%	0/ 0. %	4/ 9.8%
NCN-SUP						
ADP	2/12.5%	11/68.8%	2/12.5%	0/ 0. %	0/ 0. %	1/ 6.3%
ENG	21/32.8%	34/53.1%	4/ 6.3%	3/ 4.7%	1/ 1.6%	1/ 1.6%
TOTAL	23/28.7%	45/56.2%	6/ 7.5%	3/ 3.7%	1/ 1.3%	2/ 2.5%
SIGNED	35/28.9%	65/53.7%	10/ 8.3%	4/ 3.3%	1/ 0.8%	6/ 5.0%
NCNAME	10/34.5%	18/62.1%	0/ 0. %	1/ 3.4%	0/ 0. %	0/ 0. %
OVERALL						
RATING	45/30.0%	83/55.3%	10/ 6.7%	5/ 3.3%	1/ 0.7%	6/ 4.0%

(Continued)

Table II. (Continued)

STATEMENT(40): EVERY USER GUIDE SHOULD CONTAIN AN EXAMPLE PROBLEM.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	19/54.3%	12/34.3%	1/ 2.9%	0/ 0. %	0/ 0. %	3/ 8.6%
TCTAL	23/56.1%	14/34.1%	1/ 2.4%	0/ 0. %	0/ 0. %	3/ 7.3%
NON-SUP						
ADP	8/50.0%	7/43.8%	0/ 0. %	0/ 0. %	0/ 0. %	1/ 6.3%
ENG	48/75.0%	16/25.0%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
TCTAL	56/70.0%	23/28.7%	0/ 0. %	0/ 0. %	0/ 0. %	1/ 1.3%
SIGNED	79/65.3%	37/30.6%	1/ 0.8%	0/ 0. %	0/ 0. %	4/ 3.3%
NCNAME	17/58.6%	12/41.4%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	96/64.0%	49/32.7%	1/ 0.7%	0/ 0. %	0/ 0. %	4/ 2.7%

STATEMENT(41): EVERY USER GUIDE SHOULD CONTAIN A DETAILED DISCUSSION OF THE THEORY AND METHOD.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	3/50.0%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	8/22.9%	16/45.7%	4/11.4%	3/ 8.6%	1/ 2.9%	3/ 8.6%
TCTAL	11/26.8%	18/43.9%	5/12.2%	3/ 7.3%	1/ 2.4%	3/ 7.3%
NON-SUP						
ADP	7/43.8%	7/43.8%	1/ 6.3%	0/ 0. %	0/ 0. %	1/ 6.3%
ENG	26/40.6%	29/45.3%	7/10.9%	2/ 3.1%	0/ 0. %	0/ 0. %
TCTAL	33/41.3%	36/45.0%	8/10.0%	2/ 2.5%	0/ 0. %	1/ 1.3%
SIGNED	44/36.4%	54/44.6%	13/10.7%	5/ 4.1%	1/ 0.8%	4/ 3.3%
NCNAME	10/34.5%	10/34.5%	7/24.1%	2/ 6.9%	0/ 0. %	0/ 0. %
OVERALL						
RATING	54/36.0%	64/42.7%	20/13.3%	7/ 4.7%	1/ 0.7%	4/ 2.7%

STATEMENT(42): EVERY USER GUIDE SHOULD CONTAIN THE DEFINITION OF ALL PROGRAM VARIABLES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	3/50.0%	2/33.3%	0/ 0. %	1/16.7%	0/ 0. %	0/ 0. %
ENG	13/37.1%	17/48.6%	1/ 2.9%	1/ 2.9%	0/ 0. %	3/ 8.6%
TCTAL	16/39.0%	19/46.3%	1/ 2.4%	2/ 4.9%	0/ 0. %	3/ 7.3%
NON-SUP						
ADP	1/ 6.3%	9/56.3%	4/25.0%	1/ 6.3%	0/ 0. %	1/ 6.3%
ENG	35/54.7%	25/39.1%	2/ 3.1%	2/ 3.1%	0/ 0. %	0/ 0. %
TCTAL	36/45.0%	34/42.5%	6/ 7.5%	3/ 3.7%	0/ 0. %	1/ 1.3%
SIGNED	52/43.0%	53/43.8%	7/ 5.8%	5/ 4.1%	0/ 0. %	4/ 3.3%
NONAME	13/44.8%	15/51.7%	1/ 3.4%	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	65/43.3%	68/45.3%	8/ 5.3%	5/ 3.3%	0/ 0. %	4/ 2.7%

(Continued)

Table 11. (Continued)

STATEMENT(43): EVERY USER GUIDE SHOULD CONTAIN AN EXPLANATION OF ALL INPUT AND OUTPUT DATA.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	5/23.3%	1/16.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	18/51.4%	14/40.0%	0/ 0. %	0/ 0. %	0/ 0. %	3/ 8.6%
TOTAL	23/56.1%	15/36.6%	0/ 0. %	0/ 0. %	0/ 0. %	3/ 7.3%
NCN-SUP						
ADP	7/43.8%	7/43.8%	1/ 6.3%	0/ 0. %	0/ 0. %	1/ 6.3%
ENG	46/71.9%	17/26.6%	0/ 0. %	0/ 0. %	1/ 1.6%	0/ 0. %
TOTAL	53/66.3%	24/30.0%	1/ 1.3%	0/ 0. %	1/ 1.3%	1/ 1.3%
SIGNED	76/62.8%	39/32.2%	1/ 0.8%	0/ 0. %	1/ 0.8%	4/ 3.3%
NONAME	13/44.8%	16/55.2%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	89/59.3%	55/36.7%	1/ 0.7%	0/ 0. %	1/ 0.7%	4/ 2.7%

STATEMENT(44): SYSTEMS LIKE NASTRAN, SAP, ETC. OFFER MANY ADVANTAGES TO THE CURRENT OR FUTURE COMPUTER USER.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	11/31.4%	15/42.9%	6/17.1%	1/ 2.9%	0/ 0. %	2/ 5.7%
TOTAL	15/36.6%	17/41.5%	6/14.6%	1/ 2.4%	0/ 0. %	2/ 4.9%
NCN-SUP						
ADP	6/37.5%	10/62.5%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	21/32.8%	26/40.6%	15/23.4%	0/ 0. %	0/ 0. %	2/ 3.1%
TOTAL	27/33.8%	36/45.0%	15/18.8%	0/ 0. %	0/ 0. %	2/ 2.5%
SIGNED	42/34.7%	53/43.8%	21/17.4%	1/ 0.8%	0/ 0. %	4/ 3.3%
NONAME	8/27.6%	15/51.7%	5/17.2%	1/ 3.4%	0/ 0. %	0/ 0. %
OVERALL						
RATING	50/33.3%	68/45.3%	26/17.3%	2/ 1.3%	0/ 0. %	4/ 2.7%

STATEMENT(45): MY ENGINEERING COMPUTER NEEDS COULD BE BETTER MET BY INSTALLING A MINI COMPUTER AT EACH DISTRICT OFFICE.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	1/16.7%	2/33.3%	1/16.7%	2/33.3%	0/ 0. %
ENG	2/ 5.7%	3/ 8.6%	16/45.7%	8/22.9%	2/ 5.7%	4/11.4%
TOTAL	2/ 4.9%	4/ 9.8%	18/43.9%	9/22.0%	4/ 9.8%	4/ 9.8%
NON-SUP						
ADP	4/25.0%	2/12.5%	7/43.8%	3/18.8%	0/ 0. %	0/ 0. %
ENG	3/ 4.7%	14/21.9%	21/32.8%	19/29.7%	5/ 7.8%	2/ 3.1%
TOTAL	7/ 8.8%	16/20.0%	28/35.0%	22/27.5%	5/ 6.2%	2/ 2.5%
SIGNED	9/ 7.4%	20/16.5%	46/38.0%	31/25.6%	9/ 7.4%	6/ 5.0%
NONAME	2/ 6.9%	6/20.7%	16/55.2%	2/ 6.9%	3/10.3%	0/ 0. %
OVERALL						
RATING	11/ 7.3%	26/17.3%	62/41.3%	33/22.0%	12/ 8.0%	6/ 4.0%

(Continued)

Table II. (Continued)

STATEMENT(46): THE CORPS NEEDS ITS OWN CENTRALIZED COMPUTER FACILITY.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	1/16.7%	2/33.3%	1/16.7%	0/ 0. %	0/ 0. %
ENG	5/14.3%	13/37.1%	13/37.1%	3/ 8.6%	0/ 0. %	1/ 2.9%
TOTAL	7/17.1%	14/34.1%	15/36.6%	4/ 9.8%	0/ 0. %	1/ 2.4%
NCN-SUP						
ADP	4/25.0%	4/25.0%	4/25.0%	4/25.0%	0/ 0. %	0/ 0. %
ENG	16/25.0%	21/32.8%	20/31.3%	4/ 6.3%	2/ 3.1%	1/ 1.6%
TOTAL	20/25.0%	25/31.2%	24/30.0%	8/10.0%	2/ 2.5%	1/ 1.3%
SIGNED	27/22.3%	39/32.2%	39/32.2%	12/ 9.9%	2/ 1.7%	2/ 1.7%
NONAME	3/10.3%	10/34.5%	9/31.0%	3/10.3%	3/10.3%	1/ 3.4%
OVERALL						
RATING	30/20.0%	49/32.7%	48/32.0%	15/10.0%	5/ 3.3%	3/ 2.0%

STATEMENT(47): THE WAY OF THE FUTURE IS TO USE MINI COMPUTERS ONLY.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	1/16.7%	2/33.3%	2/33.3%	0/ 0. %
ENG	0/ 0. %	0/ 0. %	4/11.4%	18/51.4%	6/17.1%	7/20.0%
TCTAL	1/ 2.4%	0/ 0. %	5/12.2%	20/48.8%	8/19.5%	7/17.1%
NON-SUP						
ADP	0/ 0. %	0/ 0. %	3/18.8%	8/50.0%	4/25.0%	1/ 6.3%
ENG	0/ 0. %	1/ 1.6%	7/10.9%	31/48.4%	18/28.1%	7/10.9%
TCTAL	0/ 0. %	1/ 1.3%	10/12.5%	39/48.7%	22/27.5%	8/10.0%
SIGNED	1/ 0.8%	1/ 0.8%	15/12.4%	59/48.8%	30/24.8%	15/12.4%
NCNAME	1/ 3.4%	0/ 0. %	6/20.7%	11/37.9%	10/34.5%	1/ 3.4%
OVERALL						
RATING	2/ 1.3%	1/ 0.7%	21/14.0%	70/46.7%	40/26.7%	16/10.7%

STATEMENT(48): THE WAY OF THE FUTURE IS TO USE LARGE COMPUTERS ONLY.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	2/33.3%	2/33.3%	1/16.7%	0/ 0. %
ENG	0/ 0. %	2/ 5.7%	5/14.3%	17/48.6%	3/ 8.6%	8/22.9%
TCTAL	1/ 2.4%	2/ 4.9%	7/17.1%	19/46.3%	4/ 9.8%	8/19.5%
NON-SUP						
ADP	2/12.5%	1/ 6.3%	3/18.8%	6/37.5%	4/25.0%	0/ 0. %
ENG	2/ 3.1%	7/10.9%	10/15.6%	28/43.8%	10/15.6%	7/10.9%
TCTAL	4/ 5.0%	8/10.0%	13/16.3%	34/42.5%	14/17.5%	7/ 8.8%
SIGNED	5/ 4.1%	10/ 8.3%	20/16.5%	53/43.8%	18/14.9%	15/12.4%
NCNAME	1/ 3.4%	3/10.3%	6/20.7%	9/31.0%	9/31.0%	1/ 3.4%
OVERALL						
RATING	6/ 4.0%	13/ 8.7%	26/17.3%	62/41.3%	27/18.0%	16/10.7%

(Continued)

Table II. (Continued)

STATEMENT(49): THE WAY OF THE FUTURE IS TO USE BOTH LARGE AND MINI COMPUTERS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	3/50.0%	0/0.0%	1/16.7%	0/0.0%	0/0.0%
ENG	5/14.3%	18/51.4%	6/17.1%	2/5.7%	0/0.0%	4/11.4%
TOTAL	7/17.1%	21/51.2%	6/14.6%	3/7.3%	0/0.0%	4/9.8%
NCN-SUP						
ADP	7/43.8%	6/37.5%	1/6.3%	1/6.3%	1/6.3%	0/0.0%
ENG	13/20.3%	31/48.4%	11/17.2%	3/4.7%	2/3.1%	4/6.3%
TOTAL	20/25.0%	37/46.2%	12/15.0%	4/5.0%	3/3.7%	4/5.0%
SIGNED	27/22.3%	58/47.9%	18/14.9%	7/5.8%	3/2.5%	9/6.6%
NCNAME	4/13.8%	16/55.2%	6/20.7%	3/10.3%	0/0.0%	0/0.0%
OVERALL						
RATING	31/20.7%	74/49.3%	24/16.0%	10/6.7%	3/2.0%	8/5.3%

STATEMENT(50): THE WAY OF THE FUTURE IS TO USE CORPS MANAGED COMPUTERS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	3/50.0%	1/16.7%	1/16.7%	1/16.7%	0/0.0%	0/0.0%
ENG	3/8.6%	7/20.0%	11/31.4%	6/17.1%	1/2.9%	7/20.0%
TOTAL	6/14.6%	8/19.5%	12/29.3%	7/17.1%	1/2.4%	7/17.1%
NON-SUP						
ADP	1/6.3%	7/43.8%	5/31.3%	2/12.5%	1/6.3%	0/0.0%
ENG	5/7.8%	23/35.9%	19/29.7%	5/7.8%	6/9.4%	6/9.4%
TOTAL	6/7.5%	30/37.5%	24/30.0%	7/8.8%	7/8.8%	6/7.5%
SIGNED	12/9.9%	38/31.4%	36/29.8%	14/11.6%	8/6.6%	13/10.7%
NCNAME	4/13.8%	10/34.5%	13/44.8%	1/3.4%	0/0.0%	1/3.4%
OVERALL						
RATING	16/10.7%	48/32.0%	49/32.7%	15/10.0%	8/5.3%	14/9.3%

STATEMENT(51): THE WAY OF THE FUTURE IS TO USE CONTRACT COMPUTER SERVICES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/0.0%	2/33.3%	2/33.3%	2/33.3%	0/0.0%	0/0.0%
ENG	0/0.0%	12/34.3%	7/20.0%	10/28.6%	1/2.9%	5/14.3%
TOTAL	0/0.0%	14/34.1%	9/22.0%	12/29.3%	1/2.4%	5/12.2%
NCN-SUP						
ADP	0/0.0%	9/56.3%	4/25.0%	3/18.8%	0/0.0%	0/0.0%
ENG	1/1.6%	17/26.6%	19/29.7%	14/21.9%	5/7.8%	8/12.5%
TOTAL	1/1.3%	26/32.5%	23/28.7%	17/21.3%	5/6.2%	8/10.0%
SIGNED	1/0.8%	40/33.1%	32/26.4%	29/24.0%	6/5.0%	13/10.7%
NONAME	2/6.9%	8/27.6%	10/34.5%	6/20.7%	1/3.4%	2/6.9%
OVERALL						
RATING	3/2.0%	48/32.0%	42/28.0%	35/23.3%	7/4.7%	15/10.0%

(Continued)

Table II. (Continued)

STATEMENT(52): THE WAY OF THE FUTURE IS TO USE A COMBINATION OF
CORPS COMPUTER AND CONTRACT SERVICES.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	2/33.3%	4/66.7%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	3/ 8.6%	23/65.7%	4/11.4%	1/ 2.9%	1/ 2.9%	3/ 8.6%
TOTAL	5/12.2%	27/65.9%	4/ 9.8%	1/ 2.4%	1/ 2.4%	3/ 7.3%
NCN-SUP						
ADP	8/50.0%	6/37.5%	2/12.5%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	15/23.4%	31/48.4%	11/17.2%	6/ 9.4%	0/ 0. %	1/ 1.6%
TOTAL	23/28.7%	37/46.2%	13/16.3%	6/ 7.5%	0/ 0. %	1/ 1.3%
SIGNED	28/23.1%	64/52.9%	17/14.0%	7/ 5.8%	1/ 0.8%	4/ 3.3%
NCNAME	8/27.6%	15/51.7%	5/17.2%	0/ 0. %	0/ 0. %	1/ 3.4%
OVERALL						
RATING	36/24.0%	79/52.7%	22/14.7%	7/ 4.7%	1/ 0.7%	5/ 3.3%

STATEMENT(53): INTERACTIVE COMPUTER GRAPHICS DEVICES WILL HAVE A
MAJOR IMPACT ON COMPUTER AIDED DESIGN.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	4/66.7%	2/33.3%	0/ 0. %	0/ 0. %	0/ 0. %	0/ 0. %
ENG	9/25.7%	19/54.3%	5/14.3%	0/ 0. %	0/ 0. %	2/ 5.7%
TOTAL	13/31.7%	21/51.2%	5/12.2%	0/ 0. %	0/ 0. %	2/ 4.9%
NON-SUP						
ADP	10/62.5%	5/31.3%	1/ 6.3%	0/ 0. %	0/ 0. %	0/ 0. %
ENG	14/21.9%	35/54.7%	12/18.8%	2/ 3.1%	1/ 1.6%	0/ 0. %
TOTAL	24/30.0%	40/50.0%	13/16.3%	2/ 2.5%	1/ 1.3%	0/ 0. %
SIGNED	37/30.6%	61/50.4%	18/14.9%	2/ 1.7%	1/ 0.8%	2/ 1.7%
NCNAME	12/41.4%	13/44.8%	4/13.8%	0/ 0. %	0/ 0. %	0/ 0. %
OVERALL						
RATING	49/32.7%	74/49.3%	22/14.7%	2/ 1.3%	1/ 0.7%	2/ 1.3%

STATEMENT(54): THE CORPS HAS NO COMPUTER RELATED NEEDS THAT
PRIVATE FIRMS CAN NOT MEET.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	2/33.3%	3/50.0%	1/16.7%	0/ 0. %	0/ 0. %
ENG	0/ 0. %	5/14.3%	10/28.6%	15/42.9%	2/ 5.7%	3/ 8.6%
TOTAL	0/ 0. %	7/17.1%	13/31.7%	16/39.0%	2/ 4.9%	3/ 7.3%
NON-SUP						
ADP	0/ 0. %	4/25.0%	5/31.3%	3/18.8%	4/25.0%	0/ 0. %
ENG	2/ 3.1%	6/ 9.4%	23/35.9%	23/35.9%	9/14.1%	1/ 1.6%
TOTAL	2/ 2.5%	10/12.5%	28/35.0%	26/32.5%	13/16.3%	1/ 1.3%
SIGNED	2/ 1.7%	17/14.0%	41/33.9%	42/34.7%	15/12.4%	4/ 3.3%
NONAME	0/ 0. %	4/13.8%	10/34.5%	10/34.5%	5/17.2%	0/ 0. %
OVERALL						
RATING	2/ 1.3%	21/14.0%	51/34.0%	52/34.7%	20/13.3%	4/ 2.7%

(Continued)

Table II. (Continued)

STATEMENT(55): THE LOW COST OF CORPS-MANAGED COMPUTERS IS A MAJOR REASON FOR UTILIZING THEM.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	2/33.3%	3/50.0%	1/16.7%	0/ 0. %	0/ 0. %
ENG	0/ 0. %	6/17.1%	16/45.7%	11/31.4%	0/ 0. %	2/ 5.7%
TCTAL	0/ 0. %	8/19.5%	19/46.3%	12/29.3%	0/ 0. %	2/ 4.9%
NON-SUP						
ADP	0/ 0. %	4/25.0%	8/50.0%	4/25.0%	0/ 0. %	0/ 0. %
ENG	4/ 6.3%	19/29.7%	29/45.3%	9/14.1%	1/ 1.6%	2/ 3.1%
TCTAL	4/ 5.0%	23/28.7%	37/46.2%	13/16.3%	1/ 1.3%	2/ 2.5%
SIGNED	4/ 3.3%	31/25.6%	56/46.3%	25/20.7%	1/ 0.8%	4/ 3.3%
NONAME	0/ 0. %	9/31.0%	17/58.6%	3/10.3%	0/ 0. %	0/ 0. %
OVERALL						
RATING	4/ 2.7%	40/26.7%	73/48.7%	28/18.7%	1/ 0.7%	4/ 2.7%

STATEMENT(56): THE GOOD SERVICE OF PRIVATE COMPUTERS MORE THAN JUSTIFIES THEIR HIGH COST.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	3/50.0%	0/ 0. %	3/50.0%	0/ 0. %	0/ 0. %
ENG	0/ 0. %	3/ 8.6%	18/51.4%	10/28.6%	0/ 0. %	4/11.4%
TOTAL	0/ 0. %	6/14.6%	18/43.9%	13/31.7%	0/ 0. %	4/ 9.8%
NCN-SUP						
ADP	1/ 6.3%	3/18.8%	10/62.5%	2/12.5%	0/ 0. %	0/ 0. %
ENG	3/ 4.7%	10/15.6%	37/57.8%	9/14.1%	3/ 4.7%	2/ 3.1%
TOTAL	4/ 5.0%	13/16.3%	47/58.7%	11/13.7%	3/ 3.7%	2/ 2.5%
SIGNED	4/ 3.3%	19/15.7%	65/53.7%	24/19.8%	3/ 2.5%	6/ 5.0%
NONAME	2/ 6.9%	4/13.8%	14/48.3%	8/27.6%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	6/ 4.0%	23/15.3%	79/52.7%	32/21.3%	4/ 2.7%	6/ 4.0%

STATEMENT(57): THE CORPS SHOULD HAVE CORPS-WIDE CENTER(S) FOR DEVELOPING AND MAINTAINING STRUCTURAL PROGRAMS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	3/50.0%	1/16.7%	1/16.7%	0/ 0. %	0/ 0. %
ENG	9/25.7%	17/48.6%	6/17.1%	0/ 0. %	0/ 0. %	3/ 8.6%
TCTAL	10/24.4%	20/48.8%	7/17.1%	1/ 2.4%	0/ 0. %	3/ 7.3%
NCN-SUP						
ADP	1/ 6.3%	4/25.0%	6/37.5%	4/25.0%	1/ 6.3%	0/ 0. %
ENG	20/31.3%	36/56.3%	6/ 9.4%	1/ 1.6%	0/ 0. %	1/ 1.6%
TOTAL	21/26.2%	40/50.0%	12/15.0%	5/ 6.2%	1/ 1.3%	1/ 1.3%
SIGNED	31/25.6%	60/49.6%	19/15.7%	6/ 5.0%	1/ 0.8%	4/ 3.3%
NONAME	7/24.1%	13/44.8%	4/13.8%	3/10.3%	0/ 0. %	2/ 6.9%
OVERALL						
RATING	38/25.3%	73/48.7%	23/15.3%	9/ 6.0%	1/ 0.7%	6/ 4.0%

(Continued)

Table 11. (Continued)

STATEMENT(58): CUR OFFICE ADP CENTER KEEPS ME WELL INFORMED OF
COMPUTER PROGRAMS THAT ARE AVAILABLE FOR MY WORK.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/ 0. %	1/16.7%	2/33.3%	2/33.3%	0/ 0. %	1/16.7%
ENG	1/ 2.9%	5/14.3%	5/14.3%	17/48.6%	4/11.4%	3/ 8.6%
TOTAL	1/ 2.4%	6/14.6%	7/17.1%	19/46.3%	4/ 9.8%	4/ 9.8%
NCN-SUP						
ADP	2/12.5%	3/18.8%	6/37.5%	4/25.0%	0/ 0. %	1/ 6.3%
ENG	6/ 9.4%	13/20.3%	14/21.9%	22/34.4%	7/10.9%	2/ 3.1%
TOTAL	8/10.0%	16/20.0%	20/25.0%	26/32.5%	7/ 8.8%	3/ 3.7%
SIGNED	9/ 7.4%	22/18.2%	27/22.3%	45/37.2%	11/ 9.1%	7/ 5.8%
NCNAME	2/ 6.9%	6/20.7%	6/20.7%	13/44.8%	2/ 6.9%	0/ 0. %
OVERALL						
RATING	11/ 7.3%	28/18.7%	33/22.0%	58/38.7%	13/ 8.7%	7/ 4.7%

STATEMENT(59): CUR OFFICE ADP CENTER GIVES ADEQUATE SUPPORT FOR
MY ENGINEERING WORK.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	1/16.7%	2/33.3%	1/16.7%	1/16.7%	0/ 0. %
ENG	1/ 2.9%	12/34.3%	5/14.3%	11/31.4%	1/ 2.9%	5/14.3%
TOTAL	2/ 4.9%	13/31.7%	7/17.1%	12/29.3%	2/ 4.9%	5/12.2%
NON-SUP						
ADP	2/12.5%	6/37.5%	5/31.3%	2/12.5%	0/ 0. %	1/ 6.3%
ENG	5/ 7.8%	24/37.5%	13/20.3%	16/25.0%	5/ 7.8%	1/ 1.6%
TOTAL	7/ 8.8%	30/37.5%	18/22.5%	18/22.5%	5/ 6.2%	2/ 2.5%
SIGNED	9/ 7.4%	43/35.5%	25/20.7%	30/24.8%	7/ 5.8%	7/ 5.8%
NONAME	2/ 6.9%	9/31.0%	9/31.0%	8/27.6%	1/ 3.4%	0/ 0. %
OVERALL						
RATING	11/ 7.3%	52/34.7%	34/22.7%	38/25.3%	8/ 5.3%	7/ 4.7%

STATEMENT(60): PRESENT TURN-AROUND TIME FOR COMPUTER PROGRAM AT
CUR OFFICE ADP CENTER IS ADEQUATE.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	0/ 0. %	1/16.7%	4/66.7%	0/ 0. %	0/ 0. %
ENG	1/ 2.9%	9/25.7%	7/20.0%	11/31.4%	2/ 5.7%	5/14.3%
TOTAL	2/ 4.9%	9/22.0%	8/19.5%	15/36.6%	2/ 4.9%	5/12.2%
NON-SUP						
ADP	1/ 6.3%	6/37.5%	4/25.0%	5/31.3%	0/ 0. %	0/ 0. %
ENG	4/ 6.3%	23/35.9%	12/18.8%	18/28.1%	6/ 9.4%	1/ 1.6%
TOTAL	5/ 6.2%	29/36.3%	16/20.0%	23/28.7%	6/ 7.5%	1/ 1.3%
SIGNED	7/ 5.8%	38/31.4%	24/19.8%	38/31.4%	8/ 6.6%	6/ 5.0%
NCNAME	0/ 0. %	9/31.0%	8/27.6%	8/27.6%	3/10.3%	1/ 3.4%
OVERALL						
RATING	7/ 4.7%	47/31.3%	32/21.3%	46/30.7%	11/ 7.3%	7/ 4.7%

(Continued)

Table II. (Concluded)

STATEMENT(61): A COMPUTER PROGRAMMING SECT./BRANCH WITHIN THE
ENGINEERING DIV. WILL HELP ME USE THE COMP. MORE IN MY WORK.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	0/0.0%	3/50.0%	1/16.7%	2/33.3%	0/0.0%	0/0.0%
ENG	5/14.3%	12/34.3%	9/25.7%	5/14.3%	0/0.0%	4/11.4%
TOTAL	5/12.2%	15/36.6%	10/24.4%	7/17.1%	0/0.0%	4/9.8%
NON-SUP						
ADP	4/23.5%	7/41.2%	3/17.6%	2/11.8%	0/0.0%	0/0.0%
ENG	13/20.0%	22/33.8%	19/29.2%	6/9.2%	3/4.6%	0/0.0%
TOTAL	17/21.0%	29/35.8%	22/27.2%	8/9.9%	3/3.7%	0/0.0%
SIGNED	22/18.2%	44/36.4%	32/26.4%	15/12.4%	3/2.5%	4/3.3%
NCNAME	4/13.3%	12/40.0%	4/13.3%	8/26.7%	0/0.0%	1/3.3%
OVERALL						
RATING	26/17.3%	56/37.3%	36/24.0%	23/15.3%	3/2.0%	5/3.3%

STATEMENT(62): ONE OR MORE FULL-TIME ENG. IN DIST. OFFICE NEEDED
FOR ENG. PROG. DEV. AND PROVIDING INFO. ON COMPUTER SYSTEMS.

SUPERVI	STRONG A.	AGREE	NO PREF.	DISAGREE	STRONG D.	NO VOTE
ADP	1/16.7%	4/66.7%	1/16.7%	0/0.0%	0/0.0%	0/0.0%
ENG	4/11.4%	16/45.7%	7/20.0%	6/17.1%	0/0.0%	2/5.7%
TOTAL	5/12.2%	20/48.8%	8/19.5%	6/14.6%	0/0.0%	2/4.9%
NON-SUP						
ADP	3/17.6%	11/64.7%	1/5.9%	0/0.0%	0/0.0%	1/5.9%
ENG	22/33.8%	23/35.4%	13/20.0%	2/3.1%	3/4.6%	0/0.0%
TOTAL	25/30.9%	34/42.0%	14/17.3%	2/2.5%	3/3.7%	1/1.2%
SIGNED	30/24.8%	54/44.6%	22/18.2%	8/6.6%	3/2.5%	3/2.5%
NCNAME	6/20.0%	15/50.0%	7/23.3%	1/3.3%	0/0.0%	0/0.0%
OVERALL						
RATING	36/24.0%	69/46.0%	29/19.3%	9/6.0%	3/2.0%	3/2.0%

In accordance with ER 70-2-3, paragraph 6c(1)(b), dated 15 February 1973, a facsimile catalog card in Library of Congress format is reproduced below.

Corps-Wide Conference on Computer-Aided Design in Structural Engineering, New Orleans, La., 1975.

[Proceedings ... held in New Orleans, Louisiana, 22-26 September 1975] Vicksburg, Miss., Automatic Data Processing Center, U. S. Army Engineer Waterways Experiment Station, 1976-

12 v. illus. 27 cm.

Contents.-v.1 Management report.-v.2. List of computer programs for CADSE.-v.3. Invited speeches and technical presentations.-v.4. Division presentations.-v.5. State-of-the-Corps-Art (SOCA) reports on gravity monoliths, U-frame locks, and channels.-v.6. SOCA reports on gates, stoplogs, and trashracks.-v.7. SOCA reports on single- and multiple-cell conduits and tunnels.-v.8. SOCA reports on pile foundations and sheet pile cells.-v.9. SOCA reports on sheet pile walls and T-walls.-v.10. SOCA reports on stiffness methods, frames, and military construction.-v.11. SOCA reports on earthquake and dynamic analyses.-v.12. Interactive graphics, SEARCH and CORPS systems.

(Continued on next card)

Corps-Wide Conference on Computer-Aided Design in Structural Engineering, New Orleans, La., 1975.

[Proceedings ...] 1976-
(Card 2)

1. Computer-aided design -- Congresses. 2. Design -- Congresses. 3. Structural engineering -- Congresses.
I. U. S. Army. Corps of Engineers. II. U. S. Waterways Experiment Station, Vicksburg, Miss.
TA641.C67 1975